California Department of Transportation
Transportation Economics

California Bypass Study

The Economic Impacts of Bypasses
Volume 1: Planning Reference

FINAL REPORT

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May 2006

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INTRODUCTION

By rerouting traffic around the main streets of small towns, highway bypasses can provide a number of direct transportation benefits, such as diverting unwanted traffic, increasing roadway safety, reducing travel delays, and improving local access for people and goods. While these traffic impacts are well-understood, bypasses also have the potential to impact local economies. Area business owners may fear potential reductions in sales, while civic leaders may look forward to redeveloping downtown or promoting development along the new bypass.

California is planning a number of bypasses over the next few years, particularly as the State Highway System matures and bypasses help to relieve congestion in local communities. Understanding the potential economic impacts is particularly important since local stakeholders often raise economic considerations to support or oppose proposed bypasses. Although the California Division of Highways conducted small studies in the 1950s, there have not been many studies of the economic impacts of California bypasses in recent years.

The California Department of Transportation (Caltrans) sponsored the California Bypass Study to improve basic knowledge about the impacts of bypasses on small-town economies. The study included an investigation into the economic impacts of recent bypasses nationally and in California. This research is intended to foster better planning and construction of highway bypass projects by allowing the State to:

- Develop a better understanding of the economic, fiscal and other closely related social and environmental impacts on communities affected by highway bypasses

- Identify factors that can adversely affect the economic health of communities and the development of a standard methodology for the analysis of the economic impacts of bypass projects

- Promote better project planning, design and implementation of bypass projects on a statewide basis to minimize adverse economic impacts and to maximize beneficial outcomes of such projects

- Consider fully "community livability," "context sensitive solutions" and "environmental justice" issues in project planning and implementation as they relate to proposed bypass projects.

Although bypasses are planned for California communities of all sizes, the study focused on small towns, where bypasses are more likely to affect the local economy. In these settings, disruptions to a few local businesses can result in large impacts. Smaller

communities also tend to have fewer alternative highway routes, making the addition of bypasses more significant.

As part of the California Bypass Study, the project team investigated previously constructed highway bypasses, both in California and other states, on a before-and-after (with-and-without) basis. Information about other states comes primarily from literature reviews, while direct field visits and published data provide substantial information about the California experience.

The project team produced a database of four previously constructed and ten planned bypasses in California small towns. From a review of theoretical research and field research in California, the team developed best practices and lessons learned to help Caltrans planners and engineers plan for future bypasses. The project team also developed a spreadsheet tool that helps forecast potential economic impacts for planned bypasses. The Highway Bypass Impact (HBI) Model provides a range of possible impacts for use in discussions with the local community. The project included extensive field work and site visits to ensure that the results reflect the views of local stakeholders and is context sensitive.

Summary Findings

This report describes what the project team learned about the economic impacts of bypasses and is intended to serve as a reference handbook for Caltrans planners and engineers. In general, bypasses impact the local economy as a function of the type of traffic addressed. Businesses in communities with heavy local traffic or with through traffic that does not stop will not be impacted. Communities that provide services to pass-through traffic are more likely to be impacted.

Caltrans planners and engineers, local business leaders, and local governments should consider several issues in planning and designing bypasses:

What types of towns are impacted economically?

- Highway-oriented towns have a much harder time transitioning their economies after bypasses are constructed than those that cater to local residents or offer tourist attractions.

- Towns that serve as residential communities or as tourist destinations can benefit from reduced traffic and improved safety as a result of highway bypasses. Local government and the business community may need to engage in complementary efforts, such as marketing, downtown redevelopment, additional parking, and sidewalk improvements, to take advantage.

- Towns that serve regional markets by providing services, such as big box retail, automobile dealers, department stores, or hospitals, may experience little or no economic impacts. If a bypass provides better access to regional services, the local economy may actually improve as the town expands its regional draw.

- Towns with other economic bases, such as government employment, mining, agriculture, manufacture, etc. are not likely to be economically impacted by bypasses.

Which businesses are impacted?

- Gas stations and quick service or fast food restaurants cater the most to pass-through traffic. They are most likely to be impacted by the diversion of traffic due to bypasses.

- Other visitor-serving businesses, such as motels, art galleries, antique stores, and curio shops, cater more to visitors attracted to the community as a destination rather than those simply passing through. These businesses are less likely to be negatively impacted by bypasses and may find that business improves if the downtown is turned into a destination.

- Regionally serving businesses, such as big box retail and departments stores, may benefit from improved access.

- Businesses that serve local residents, such as drug stores, banks, and grocery stores are generally not impacted by bypasses.

What other impacts occur?

- Bypasses often have a short-term (and negative) impact on the local economy, but retail sales often improve in the longer term. However, some communities may never fully recover.

- The construction of a bypass may also provide an opportunity for revitalization of the local community.

- Bypasses are often promoted as improving pedestrian safety along Main Street. Since traffic accidents involving pedestrians are relatively rare events, Caltrans collision statistics may not reflect improved safety. However, bypasses may improve the perception of safety, which is a benefit in its own right.

What design features are most important?

- Visibility. Negative economic impacts (losses of customers and sales) are likely to be small for businesses that remain visible from bypasses. In some cases, the goal of making downtowns visible from bypasses may conflict with the desire to protect communities from noise and visual impacts. Caltrans can provide some "visibility" for businesses through signage.

- Distance from downtown. Bypasses located close to existing downtowns are less likely to hurt local economies. Travelers may be able to see businesses and access times are shorter.

- Direct access. Highway interchanges can provide direct access from bypasses to downtowns and existing businesses. However, interchanges can also encourage the development of competition to existing businesses by offering new "prime" locations.

- Time savings. The difference in travel time between the old route and the new bypass determines how many vehicles (and potential customers) divert to the bypass.

What can Caltrans do?

- In the field research, local communities offered several suggestions on how Caltrans can provide signs that may mitigate negative economic impacts. For example:

  - Caltrans could provide signs indicating services are available at the next exit. Some businesses have offered to pay for signs, but Caltrans districts have raised a concern whether the Department can be involved in "advertising" for specific businesses.

  - Caltrans could designate the existing route as a "scenic or historic" route to encourage tourist traffic. However, this must fit within the Department's guidelines for such designation.

  - A bypass could be designated as a bypass route, while the original route retains the State Route designation. This may conflict with the State's policy to avoid parallel routes.

- The large lag between initial planning and engineering and construction may discourage businesses and residents from believing that a bypass

will eventually be built. The availability of funding and regional priorities are beyond Caltrans' control, but Districts should try to keep the public actively involved, remind residents and businesses about planned bypasses, and help the community plan for the transition.

- Caltrans can work with local governments and chambers of commerce to encourage businesses to plan early for bypasses. Businesses may choose to market to local residents, change their line of business, or relocate.

- Caltrans should continue to recognize the need to conduct early analyses of impacts on tribal governments, facilities, and economies. Districts need to consult in the earliest planning stages and on an on-going basis with the Native American communities as critical stakeholders for transportation planning.

What can local communities do?

- Local communities can take advantage of reduced general and truck traffic along Main Street by engaging in redevelopment activities, such as main street programs, the provision of benches, planting and improved sidewalks, economic development incentives and grants, providing parking facilities, etc.

- Communities can provide roads, utilities, and other infrastructure at interchanges along the bypass to attract businesses and encourage the relocation of traffic-dependant businesses, such as gas stations and fast food restaurants.

- If a bypass remains outside of the local jurisdiction, a town can annex territory to make sure that any economic development remains inside the local tax base. Alternatively, the local community can zone the area or withhold utilities and infrastructure, so developments that compete with downtown do not occur.

- Local governments and chambers of commerce can work with local businesses to develop business plans that take into account the change in traffic due to bypasses.

- The community should have a vision of how a bypass will be integrated into the local environment (e.g., transportation flow, redevelopment, visual impact, economics, etc.).

What are other issues to consider?

- Caltrans planners and engineers should recognize that the motivations for a particular bypass may differ between Caltrans and the local community (public and government):

  - For Caltrans, the focus is on through traffic and safety issues. Caltrans typically builds bypasses to implement infrastructure plans (convert conventional highways to expressways or freeways), address mobility issues (improve traffic flow, improve level of service for inter-regional traffic, address operational issues), or mitigate safety problems.

  - For the local community, the focus is on local traffic and the impacts on downtown. The local community often expects bypasses to address problems with truck traffic (eliminate noise, dirt/dust, and safety perceptions), mobility (improve level of serve, help local circulation, reduce idling noise in downtown), and traffic control (improve appearance of traffic control measures, hold community festivals, etc.).

- Local communities often resist accepting relinquishments until significant improvements are made. However, the relinquishment of Main Street to local control can be an enticement in some cases.

- Traffic signals can address local circulation issues in rural communities, but they may not address long-term issues with through traffic.

- Bypasses may be unable to solve local circulation problems. Caltrans planners and engineers need to consider whether congestion needs to be addressed through State Highway bypasses or improvements in local roads.

Report Organization

The rest of this report is organized in the following chapters, which provide additional resources for Caltrans planners and engineers:

- *Theoretical Research* – This section summarizes academic studies of the economic impacts of bypasses. It outlines community characteristics, bypass design features, and behavioral factors that influence the economic impacts of bypasses.

- *California Case Studies* – This section describes the California bypasses visited as part of the California Bypass Study. It provides an overview

of the bypasses, data collected, and what the project team learned. Caltrans planners and engineers can use this information to anticipate potential impacts of future bypasses. A second volume of this report provides individual case studies for planners or engineers wanting to identify similar situations.

- *Highway Bypass Impact (HBI) Model* – This section provides a brief overview of the HBI Model for planners and engineers. The emphasis is on helping planners and engineers determine whether the model is an appropriate tool for a given analysis. The section describes how the model was developed, how it works, what it estimates, and how results can be interpreted. Detailed technical documentation and a user's guide with instructions on using the model are available as separate reports.

THEORETICAL RESEARCH

This section summarizes theoretical research that may be of interest to Caltrans planners and engineers. While studies of highway bypass impacts on local economies began to proliferate in the late 1980s, studies were available almost as soon as highway bypasses were constructed. For example, the California Division of Highways conducted a series of economic studies from 1949 to 1951 that examined the impact of the then new high-speed freeways and bypasses. Most of these studies compared trends in retail sales for bypassed communities with those for comparable areas. Although the methodology is similar to many recent studies, the early studies could not anticipate later trends of suburbanization, urban sprawl, retail relocation, and highway congestion. These factors make current studies more difficult to conduct and often more detailed methodologically.

In recent years, a number of national studies have examined the impacts of bypasses on local communities. There have also been several syntheses of the literature. For example, a National Cooperative Highway Research Program (NCHRP) Synthesis of Practice study uncovered a bibliography of over 100 highway bypass studies in the United States, Europe, and Australia. While the situations of California communities may differ from those in other countries and other parts of the United States, this literature is relevant for uncovering themes applicable to California. Exhibit 1 lists some of the relevant recent research on highway bypasses.

The next several sections outline findings from theoretical literature. The purpose is to highlight lessons learned in earlier studies. The report identifies key factors and economic impacts that Caltrans planners and engineers should consider when planning and designing California bypasses. A later chapter provides additional findings from field research conducted in California.

Exhibit 1: Recent Case Studies of Highway Bypasses

Reference	Study Area(s)	Methodology	Summary of Impacts
Collins and Weisbrod (2000)	Danville, Virginia I-785 Bypass	Individual case study Before-and-after comparison	Reduction in downtown truck traffic; increase in local vehicles. Overall: no evidence of negative impacts on downtown businesses. Major impact on new industrial sites near bypass interchanges.
Collins and Weisbrod (2000)	Richmond, Virginia I-295 Bypass	Individual case study Before-and-after comparison	No reduction in downtown traffic. Bypass opened sites for development in suburban ring: considerable industrial development, major regional shopping malls located near bypass interchanges, some residential development.
Collins and Weisbrod (2000)	Fort Wayne, Indiana I-469 Bypass	Individual case study Before-and-after comparison	Significant volume of truck traffic diverted. Little development at interchanges. Bypass is in rural areas with limited water and sewer capacity.
Collins and Weisbrod (2000)	Appleton, Wisconsin Route 441 Bypass	Individual case study Before-and-after comparison	Major retail development – big box stores - at bypass interchanges. Also: about 100 acres of industrial land developed; and some office space in suburban locations.
Economic Development Research Group (2000)	Roanoke, Virginia I-73 Alignments (Central, East, West)	Review and analysis of local area and project characteristics. Projections for three alternatives	Three alternatives have positive and negative impacts. Positive: opening of industrial sites at new interchanges, improved traffic conditions and increased tourism. Negative: threat to city businesses, displacement of existing businesses. Risks include insufficient sites for highway access and future development and costs of sprawl.
HLB Decision Economics Inc. (2002)	Imperial Valley Brawley Bypass and I-8/Imperial Avenue Interchange	Review and analysis of local area and proj. characteristics. Risk Analysis, Projections of Economic Development Benefits	The study found that four factors are critical to the identification of projects with true development potential. These factors include local engagement, integration of project design, development accessible and incremental forecasting framework; and implementation of risk analysis.
HLB Decision Economics Inc. (2001)	Lewistown, Montana. US 87 and US 191 Bypass	Economic feasibility analysis using transportation modeling output, Benefit cost analysis and risk analysis	The findings of this study determined that a bypass in Northeast Lewistown is not a feasible alternative. The findings were based on a comprehensive benefit- cost analysis in a risk analysis framework.
Rogers and Marshment (2000)	Stonewall and other small, rural towns in Oklahoma	Econometric analysis and anecdotal evidence	Bypass had no significant effect on already declining small town business district. No businesses relocated from old to bypass route; no new businesses were established along new route.
Wells and Farnworth (2001)	Iowa, various communities	Interviews with business owners and city leaders	Decline in sales for service stations, convenience stores, small cafes, and motels, much smaller than anticipated. Few businesses opened on or moved to locations near bypass. Residents of bypassed towns “happy” with the bypass.

Purposes of Highway Bypasses

According to the Caltrans Design and Traffic Manual, a highway bypass is “an arterial highway that permits traffic to avoid part or all of an urban area.” The manual lists several factors that Caltrans planners and engineers should review when considering bypasses of State Highway routes. These factors are summarized below.

Route Functionality and Quantitative Factors

- The major function the route serves as part of the State Highway System and its classification is an indication of the route's importance to various types of travel. The route needs to be: functionally classified as a Principal Arterial, on the National Highway System, on the Interregional Road System (state), or identified as a Surface Transportation Assistance Act (STAA) or Truck Terminal Access Route for larger trucks. Focus Routes (the ten routes and combination of routes in the Interregional Transportation Strategic Plan for priority improvements for interregional mobility) are included as demonstrating additional route importance.

- Amount of current and projected future delay to the traveling public for people and goods movement through the area, including the duration of recurrent, non-recurrent, and seasonality or event-based (major destination concerts and promotional events) delay.

- Numbers of large trucks (defined as having five or more axles) and origins/destinations (through trips versus local delivery or distribution).

- Disruption to town economic center and quality of life from current routing.

- Availability and location of services to travelers (food, lodging, car repair, etc).

Qualitative Factors

- Inclusion and priority in the Regional Transportation Plan

- Evidence of continuing support (sustained history) by the City Council/Board of Supervisors

- Contribution of regional and other funds considering funds available to the area

- Willingness of the City or County to include the bypass route in the land use element of the General Plan upon route adoption for corridor protection and compatible zoning

- Availability of reasonable bypass routing alternatives considering degree of build out of area, topography, and sensitive habitats or preserves.

Nationally, the bypassing of small and mid-sized towns started almost as soon as the Federal Aid Highway Act of 1956 passed. The Interstate Highway program introduced the American public and industry to the convenience of high speed automobile and truck transportation, which led to the construction of highway bypasses around cities and towns to maintain highway speeds for through traffic.

Theoretical research indicates that three issues have motivated the proposing, planning, and constructing of highway bypasses across the nation:

- U*pgrading existing roadway conditions.* These include safety considerations, such as attempts to lower collision rates and reduce conflicts between trucks, automobiles, bicyclists and pedestrians, as well as updates of substandard roadway to current highway standards for design speed and access management. A new bypass may also straighten point-to-point highway routing and improve user mobility.

- *Adding capacity for accommodating actual or anticipated traffic volumes.* This is particularly apparent when congestion lowers highway speeds, creates difficult driving conditions for through and local traffic, and inhibits pedestrians from crossing streets. Sometimes bypasses are motivated by the need to increase capacity for traffic with regional destinations or to provide added highway capacity for anticipated increases in traffic. Bypasses may facilitate goods movement by allowing trucks to avoid traffic lights and downtown congestion. Bypasses may also improve levels of service and control access to industrial areas or other major destinations.

- *Enhancing the "quality of life" in bypassed communities.* In the studies, quality of life generally refers to safety, including residents' concerns about downtown traffic congestion and perceptions of pedestrian safety. Quality of life enhancements often include improving traffic flows in downtowns, such as reducing overall traffic or rerouting truck traffic for the benefit of pedestrians and local traffic. A related objective for developing bypasses is the relocation of trucks and a significant portion of through traffic from downtown tourist destinations to increase the vitality of central business districts. Similar goals for bypasses are reductions in noise and air pollution, improved shopping environments, and additional residential development.

These three reasons overlap and any combination of them can enter into the decision to develop a particular bypass.

Nature of Bypass Literature

Studies generally examine the impacts of highway bypasses around smaller cities and towns. Usually, the studies focus only on the community being bypassed, although some studies try to assess how other locations may benefit. Impacts are generally measured in terms of employment, sales, or the number of businesses at a city or project level. The analyses tend to focus on retail or service businesses, especially in traffic-oriented sectors. The studies compare traffic volumes before and after construction on the bypassed and new routes.

The hypothesis is that a one-time economic change occurs, although some studies have looked at the longer-term evolution of impacts. The more nuanced studies review how town economies restructure from retail to office or service centers, how tourist economics expand, or how residential markets flourish.

In reviewing bypass studies, Caltrans planners and engineers will find that they include one or more of the following types of analysis:

- *Qualitative Case Studies.* Interviews and surveys are conducted with residents, community leaders, and local business leaders to gauge their opinions. This approach often involves a review of the "before and after" business mix in downtowns and economic changes that can be attributed to bypasses. An example of such a link is the removal of trucks leading to growth in local tourism, increased residential development, or the loss or relocation of downtown businesses.

- *Data-Driven Case Studies.* These are "before and after" comparisons based largely on population, employment and tax records from state or federal sources such as the US Census. Bypass studies are frequently supplemented with local quantitative data collection (i.e., windshield surveys and business surveys) as well as qualitative interview data.

- *Statistical Analysis.* These bypasses studies gather statistical information about a series of bypasses rather than focus on specific communities. The studies make generalizations using regression modeling or other statistical techniques. Sometimes, findings are supplemented with interviews to compare statistical findings with local impressions.

- *Contextual Factors.* In these studies, changes in the local economy are placed in the context of non-transportation factors and local economic shifts underway prior to the bypass. Bypasses may exacerbate economic trends but are not considered to be responsible for the economic change in downtowns. For example, several studies cite cases where the downtowns are losing retail share and reorganizing into office centers before the bypasses were built.

The most informative literature combines two or more approaches. Statistical analyses do take into account specific circumstances when developing overall findings. To make up for this, investigators often complement quantitative data with interviews when conducting these studies.

The studies tend to use a number of specific terms that Caltrans planners and engineers may not be familiar with. These include:

- Economic base – the set of industries that provide the "engine" or basis for the local economy. For example, Silicon Valley is driven by the high tech industry while Bakersfield exists to support agriculture. Small California towns also have economic bases.

- Pass-though traffic – traffic that travels through a community to other destinations. Other terms may be used interchangeably, such as through traffic or pass-by traffic. This report uses all three terms.

- Visitor serving businesses – retail industries that cater to visitors staying in the community. Examples include: motels, art galleries, museums, wineries, and tourist shops.

- Pass-by serving businesses - retail industries that provide services to pass-through traffic. Examples include: fast food restaurants and gas stations. Note that local residents may also use these businesses, but some establishments may be more oriented to travelers than others.

- Local serving businesses – retail industries that tend to serve the local population and not travelers. Examples include: drugs stores and banks.

- Central business district (CBD) – the downtown of a community.

- Bypassed area – the section of highway and surrounding businesses and residences that are bypassed. This often includes the downtown that had formerly been served by the State Highway.

- Main Street – the primary route through a community and its downtown. This often refers to the adopted route of a State Highway prior to construction of a bypass.

Recent Research

This section summarizes for Caltrans planners and engineers some of the recent academic articles on highway bypasses. The lessons learned from these articles are

summarized in the sections that follow and the information below is for the more technically inclined.

Wisconsin was one of the first states in recent years to study the economic impacts of bypasses extensively. The Wisconsin Department of Transportation (DOT) commissioned a series of bypass studies in the late 1980s through the 1990s, including: *Highway Bypasses: Wisconsin Communities Share Their Experiences* (1988), *The Economic Impacts of Highway Bypasses on Communities* (1998), and *US Highway 10 Relocation Alternatives Economic Impact Analysis* (1999).

In January 1998, the *Wisconsin DOT* published a study of the economic impacts of 17 small Wisconsin communities bypassed since 1980. The population of these communities ranged from about 300 to 30,000 people. The study used economic data, traffic counts, mapping, interviews, media research, and site visits to compare the 17 bypassed communities to 14 similar ("control") communities without bypasses.

The Wisconsin DOT study found that, over the long term, average traffic levels on the "old routes" in medium and large bypassed communities were close to or higher than pre-bypass counts. Continued strong economic activity in those communities provided opportunities for retail trade to flourish. Community residents and businesspeople viewed bypasses as beneficial, while understanding that the bypasses cause changes in the local economy to be addressed proactively. The communities identified several benefits of bypasses and associated, including: improved traffic flow, reduced congestion, less truck traffic, and opportunities for planned development. The authors concluded that highway bypasses had little adverse impact on overall economic activity in most communities, although bypasses had a greater potential to hurt the economies of communities with populations less than 2,000.

In a 1994 study, *Gillis and Casavant* provided case studies of state routes bypassing main streets in three small towns in eastern Washington. The case studies summarized changes in the communities using data from interviews with community leaders, business leaders and government officials as well as population and retail data from state sources. Sales tax data provided a time series indicating the magnitude of retail activities. *Gillis and Casavant* concluded that the negative impacts of bypasses were smaller for downtown business districts with well-developed local customer bases than those dependent on drive-by traffic. They also noted that bypass routes that improve access to trading centers open new opportunities in small towns.

Rogers and Marshment (2001) identified and analyzed bypasses in Oklahoma to predict the impacts of proposed bypasses along US-70. Only three bypassed areas were investigated and just one involved both a "before and after" analysis. Since statistical inferences could not be drawn from such a small sampling, *Rogers and Marshment* compared the bypasses cities to a control group of communities with demographic features and highways similar to the selected bypassed communities. *Rogers and Marshment* examined a number of factors in the case studies, including population, sales

tax, number of nearby State Highways and US routes, and retail trade. Using a method comparable to *Gillis and Casavant*, they used sales tax revenues as a proxy for measuring retail activities. *Rogers and Marshment* also conducted site visits to count business establishments and collect qualitative data.

The Oklahoma study accounted for significant economic indicators and non-highway related factors, including environmental regulations. The study also placed economic performance in the context of energy-related factors, including regulation of underground storage tanks and changes within the national oil and gas industry. While these factors may be important factors in Oklahoma, they are less critical in states without significant oil and gas exploration.

Andersen et. al. developed econometric models that incorporated data on retail sales, gasoline sales, restaurant sales, and service receipts to analyze the economic base, changes in business volume, and related economic impacts of highway bypasses on six small Texas cities. Similar to *Rogers and Marshment*, the authors developed the analysis with control communities and buttressed the quantitative results with site visits. The study concluded that the economic impacts of highway bypasses on rural small cities are not uniform and appeared to be minor in most cases. Econometric models showed that bypasses generally brought small, but statistically significant, decreases in business volume. Cluster analysis highlighted the importance of the existing economic base.

Interviews revealed that local perceptions were not necessarily negative. Those interviewed cited bypass construction as one of many factors contributing to the overall economic performance of cities. After initial commercial downturns, the bypasses often led to the reorientation of businesses to local customers. Business and political leaders frequently played important roles in the evolution of the cities after bypasses opened.

Through the National Cooperative Highway Research Program (NCHRP), *Buffington and Womack* (1995) surveyed 47 state DOTs and six Canadian provinces. They did not conduct their own interviews and relied on secondary data. The study concentrated on impacts in the areas bypassed and along the new bypasses. The overall assessment of economic impacts in bypassed areas was inconclusive, although traffic-serving businesses (e.g., gas stations, restaurants, and motels) were the most likely to be hurt. The authors concluded that declines seen in bypassed areas were attributable to unrelated economic trends, which may have been hastened by the bypasses. Although the study examined slightly larger towns (a population threshold of 5,000 people compared to 2,000 people), *Buffington and Womack* confirmed the findings in *Gillis/ Casavant* that population is an important indicator of community sensitivity to economic impacts.

The NCHRP report shows that highway-serving business activity declined in 18 of 61 cases. Overall, ten of the 141 bypasses communities studied had negative impacts. Seven out of ten were in small communities (which accounted for 71 of the 141 total). However, the data taken from surveys and past studies were not uniform. In assessing

bypass impacts in the United Stats and Canada, the authors concluded that overall positive impacts may be connected with communities' ability to extend political boundaries (and taxation) to encompass new development along bypasses.

Similar to *Buffington and Womack*, researchers at the University of Kentucky (*Thompson, Miller and Roenker, 2001*) assessed the impacts of bypasses in Kentucky on both bypassed areas and land near the new bypasses. The authors looked at eight bypasses and established a pairing of bypass communities with similar communities. They combined statistical methods with site visits and interviews to gather opinions as well as quantitative data.

Thompson, Miller and Roenker reported findings in the aggregate and did not write individual case studies for the eight sites. Interviews were summarized and reported by community in an appendix. Thompson et. al. considered several variables, including retail trade, population, quality of building stock, traffic congestion, land use and environment. The mean 1990 population for the communities studied was about 4,000. Much of the analysis centered on county-wide changes, so positive and negative local impacts might have balanced. Analyses conducted at the local level showed that the reallocation of retail from downtowns to bypass areas stemmed from new retail, not relocation of existing businesses. Moreover, bypasses tended to reallocate office space away from the bypassed areas. The authors noted that vacancies averaged 18.4 percent for downtowns with bypasses compared to 10.9 percent for the paired central business districts (CBDs) without bypasses. However, the majority of downtown business owners interviewed believed that the construction of bypasses had either positive or insignificant impacts on local retail and service industries. The researchers stated that findings were limited due to the small sample size (eight communities).

Hartegen, et. al. (1991) provides insight on how bypasses might attract new development or dislocate development from bypassed communities. The study includes a statistical analysis of 22 interchanges in North Carolina and 63 nationally to illustrate the roles of traffic volume, distance from downtown, and prevalence of water and sewer in attracting motels, gas stations, fast food and sit-down restaurants and spurring housing development.

Burress (1996) reviews some of the economic impacts of bypasses on 21 small Kansas towns. Similar to the Wisconsin findings, he found that in the long term, bypasses do not have significantly negative effects on the local economy. Most counties and many towns may have benefited in the long term from the construction of bypasses. While not all travel-related firms in bypassed towns were impacted negatively, bypasses probably did have transitory impacts on selected travel-oriented businesses, including restaurants, bars, motels, and service stations. *Burress* suggested that areas primarily oriented to travel-related services might experience severe impacts and require economic restructuring. Mirroring findings from the Oklahoma studies, the Kansas study found that national and regional economic and population trends were more important than bypass construction in determining economic effects.

In a 1991 study for the Iowa Department of Transportation, *Anderson and Otto* (1991) examined 11 rural communities with highway bypasses. Populations of the communities ranged from 673 to nearly 7,900 people. The study found that the benefits of improved traffic flow around the communities did not appear to be offset by aggregate losses in retail sales. The authors share *Burress*' conclusion that service stations, convenience stores, motels, small cafes are most likely to experience declines associated with new bypass construction.

Anderson and Otto also considered local perceptions of bypass impacts. They concluded that several positive externalities were associated with bypasses: reduced traffic congestion, fewer collisions, and increased sales attributed to the reduced congestion and easier parking. They also found that the discontent of local merchants with the bypasses increased with the distance between the bypass and the local central business district. A majority of respondents supported the bypasses and most merchants agreed that traffic volume and noise had decreased since the bypasses were built.

In 1988, *Wisconsin DOT* profiled the impacts of bypasses in Rice Lake and Sturgeon Bay through local interviews and local surveys. Both communities were major waterfront tourist destinations. As a result, removing truck traffic from these towns was beneficial to the local economies. Retail trade increased in both towns and average daily traffic on both old and new bypass routes increased.

The economic benefit of bypasses for tourist destinations is also highlighted in a pair of Australian case studies by the *Canberra Bureau of Transport and Communications Economics* (1994). The Bureau compared a bypass in a small, "cute" tourist-oriented town with a bypass in a larger non-tourist community, where a number of establishments served through traffic. The bypass in Berrima (population 425) improved the town's tourist appeal by reducing traffic and eliminating through truck traffic. The result was a pleasant, pedestrian-oriented tourist community. The study noted the growth in new bed and breakfasts, gift shops and restaurants. In contrast, Mittagon (population 4,240) did not have a tourist economy and saw a decline in business activity, including gas stations, motels and fast food restaurants. The study used interviews and surveys, statistical analyses, and public economic data.

Economic Development Research Group (2000) conducted an analysis of bypass routes in medium-sized cities using interviews, supplemented by traffic data and publicly available economic data, to determine before and after impacts of bypasses. Like the *Hartegen* studies, *Economic Development Research Group* compares the impacts of bypasses on older communities with the land-use changes near the new bypasses. Across the case studies, bypasses frequently led to positive changes by removing heavy truck traffic from downtowns and opening additional industrial sites along the new routes. This attracted new, outside investment. The negative impacts included increased low density commercial and residential development that led to additional environmental and infrastructure costs.

Factors Influencing Economic Impacts

Caltrans planners and engineers should realize that highway bypass studies tell a consistent story. They indicate new highways seldom devastate or save downtowns. Shifts in traffic patterns cause some businesses to close or relocate, but they also have the potential to create new business opportunities in the bypassed downtown areas. For business districts already draw local customers or are destinations for visitors, a reduction in downtown traffic congestion is most likely to strengthen the downtown. Like most issues in economics, consumer behavior governs how highway bypasses impact downtown economies.

For Caltrans planners and engineers, most of the factors related to bypasses can be placed into one of five categories:

- Spatial Context (Land Pattern and Bypass Design)
- Land Use and Development Factors in Bypassed Area and Near Bypass
- Characteristics of Local Economy (Business Mix in Pre-Bypass Communities)
- Traffic Characteristic (Pre-Bypass Origin-Destination and Trip Purpose)
- Demographics.

Planners and engineers should also think about a sixth category, environmental factors, that may be used to justify projects. However, bypasses are less likely to impact environmental factors directly.

Exhibit 2 lists factors identified in the theoretical literature grouped into these six categories. The exhibit also includes three columns indicating whether the factors are related to consumer behavior, project justification, or project impacts. Behavioral factors generally have to do with the traffic, physical, or economic settings of bypass projects. Project justifying factors are more likely to be cited by decision makers and reported in project planning documents, such as Project Study Reports (PSRs) and Route Concept Reports (RCRs). The behavioral and justification factors overlap considerably.

The impact of bypasses can be varied and so are the measures that capture these impacts. The third column in Exhibit 2 indicates some of the potential impact areas. These often overlap with the factors that influence driver behavior. Bypass impacts are generally captured by spatial, economic, demographic, and traffic measures.

Exhibit 2: Relevant Factors to Consider

Factors	Behavioral Driver	Project Justification	Project Impact
1. Spatial Context (Land Pattern and Bypass Design)			

Factors	Behavioral Driver	Project Justification	Project Impact
Nature of Bypassed Area (e.g., central business district, entire community)	X	X	X
Nature of New Route (i.e., urban, fringe or rural)	X		X
Bypass Design (e.g., reroute highway, split business/bypass choice)	X	X	X
Highway Access (i.e., limited access or normal access with curb cuts)	X	X	X
Distance Between Proposed Bypass and Central Business District (CBD)	X		X
Distance from Bypassed Community to Other Population Centers	X		X
Other Bypass Information (e.g., completion year, length)			X
2. Land-Use and Development Factors in Bypassed Area and Near Bypass			
Developable Land at Bypass and in Community	X	X	
Available Infrastructure (e.g., water, sewer, ancillary roads)	X	X	
Proactive Zoning to Build Infrastructure (location of bypass in same municipality as bypassed road, bypassed municipality's ability to annex bypass area)	X	X	
Active and Stable Business Organizations (e.g., chamber, downtown business organization)	X	X	
3. Characteristics of Local Economy (Business Mix in Pre-Bypass Communities)			
Local Community-Serving Businesses	X	X	
Passing Traffic-Serving Businesses	X	X	
Regional-Serving Business Center	X	X	
Tourism or Special Attraction Location	X	X	
Special Features (e.g., government offices, schools)	X		
Stability of Local Economic Base	X	X	
Economic Trends Before and After Bypass (e.g., retail sales, number of establishments)	X	X	X
Separation of Competing Urban Centers	X		
4. Traffic Characteristic (Pre-Bypass Origin-Destination and Trip Purpose)			
Locally-Based Traffic	X	X	X
Through Truck (Freight) Traffic	X	X	X
Through Passenger Traffic – Tourism and Personal Visitor Trips	X	X	X

Factors	Behavioral Driver	Project Justification	Project Impact
Through Passenger Traffic – Business Trips, Service Delivery	X	X	X
Level of Service and Extent of Congestion and Safety	X		X
Speed Limit on Bypass and Local Road	X		X
Type of Road Bypassed (i.e., Interstate, US or State Highway)	X	X	X
Adequacy of Downtown Parking	X	X	
Other Highways Passing Through Town	X		
5. Demographics			
Population Characteristics (e.g., population, median age)	X		X
Employment (e.g., total, employment by industry, growth in employment, fraction in labor force)		X	X
Income/Buying Power/Market	X		X
6. Environmental Factors			
Air Quality		X	
Noise (to the extent available)		X	

Caltrans planners and engineers should find the next sections particularly useful for considering the context of California bypass projects and addressing community groups. These sections provide case studies and evidence from academic studies that describe the importance of the factors listed in Exhibit 2. The primary and secondary relationships between behavioral factors and bypass impacts are discussed first. General research findings and specific bypass examples are also cited.

1. Spatial Context (Land Pattern and Bypass Design)

The distances between the bypass, the community it bypassed, and other population or commercial centers are important indicators of bypass impacts. In addition to the physical proximity, there are a number of design issues that would ease connections between downtown and a bypass, as well as factors that might limit access.

In general, a bypass area competes with the bypassed downtown for customers and commercial base if it is within three miles of downtown, has water and sewer, and is more than five miles from the next nearest service exits. However, a bypass area can be integrated with the downtown if it is less than two miles away and has supporting water and sewer services.

General Research Findings

- **National.** Assuming appropriate zoning and infrastructure are in place or obtainable, a national study shows that travel-oriented development, such as motels, gas stations and fast food restaurants, has a strong negative correlation with residential development.[1]

- **Iowa and Minnesota**. Surveys of merchants located in bypassed communities show that merchants are more likely to oppose bypasses as the distances between CBDs and proposed bypasses increase.[2]

- **Texas and North Carolina.** Traffic is hard to divert from a bypass to downtown if the bypass is part of a high-speed freeway. Lessons from Texas and North Carolina suggest that the negative impacts of bypasses on downtowns can be minimized by facilitate linkages through enhanced physical access and relatively low-cost signage.[3]

Specific Examples

- **West Bend, WI.** The US 45 bypass provides an efficient route for the movement of goods and services. As a result, the bypass diverted significant truck and through traffic. By reducing downtown congestion, the bypass facilitated pedestrian access and helped promote the downtown as a shopping area.[4]

- **Omak and Okanogan, WA.** Locals do not agree whether the bypass of SR-97 in Omak and Okanogan was beneficial or detrimental. Some local business representatives and officials point to new retail (e.g., Wal-Mart) along the bypass as draining the downtown economy. Others say that the retail brings new customers to area. The downtown economy was helped by increasing traffic on Highway 215 through town. Many travelers take Highway 215 to reach a new mall and business sales along the route have been increasing.[5]

- **Sturgeon Bay, WI.** A substantial portion of the downtown business community feels that the bypass isolates downtown from potential

1 *Hartgen, David, et. al., "Growth at Rural Interchanges: What, Where, Why," University of North Carolina at Charlotte for the Transportation Research Board, 1991.*

2 *Andersen, S. Johann, et. al.,"Economic Impact of Highway Bypasses," Center for Transportation Research, University of Texas, Austin. Date Unknown.*

3 *Wisconsin Department of Transportation, "The Economic Impacts of Highway Bypasses on Communities,"1998.*

4 *Wisconsin Department of Transportation, "The Economic Impacts of Highway Bypasses on Communities," 1998.*

5 *Gillis, William R." Lessons from Eastern Washington: State Route Main Streets, Bypass Routes and Economic Development in Small Towns," Washington State University and Washington State Department of Transportation, 1994.*

traffic. In part, this is due to poor lighting and road surfaces on the connection between the bypass and downtown that has led to dangerous driving conditions and noise.[6]

- **Richmond, VA.** The retention of the original route designation through town encouraged businesses to stay after a bypass was constructed. Inner-city tourism was stimulated by targeted signage.[7]

In rural small towns, bypasses can improve access to trade centers and provide opportunities for economic development in town

Specific Examples

- **Rosalia, WA.** The SR-195 bypass reduced congestion and truck traffic in Rosalia, which helped enhance the small-town lifestyle. The bypass also reduced the driving time from Rosalia to Spokane, which allowed the community to attract professionals who commute to Spokane.[8]

- **Rush Springs, OK.** A new bypass route provided easier access to nearby population centers and a regional Wal-Mart. While this improved access hurt downtown businesses, it increased the job market radius for Rush Springs residents.[9]

2. Land Use and Development Factors in Bypassed Area and Near Bypass

The presence of infrastructure and planning controls on previously undeveloped land (i.e., greenfields) often determines the pace of economic growth and the extent of sprawl development that occurs near bypasses. Bypass routes require complementary infrastructure (e.g., water, sewer, and local roads) to draw business, potentially from the bypassed downtown. Economic development around bypass interchanges will not occur until infrastructure is planned, financed, and built, which means economic development might not occur for decades if infrastructure is not built concurrent with the project. However, relief from though truck traffic or excessive traffic provides the opportunity to develop or sustaining strong residential communities in bypassed areas. This may also support locally oriented business communities.

6 *Wisconsin Department of Transportation, "Highway Bypasses: Wisconsin Communities Share Their Experiences," 1988.*

7 *Economic Development Research Group, "Economic Impact of I-73 Alignments on Roanoke," 2000*

8 *Gillis, William R.*

9 *Rogers, Cynthia and Richard S. Marshment, "Methodology for Determining the Impact of Highway Bypasses in Oklahoma," University of Oklahoma for the Oklahoma Department of Transportation, 2001.*

General Research Findings

- **National.** A national survey confirmed that downtowns can not compete economically with developable land along bypasses. A University of Kentucky study found that the reallocation of retail from downtown to the bypass area stems from new retail outlets opening at bypass, not from relocation of existing businesses. [10]

- **National.** Infrastructure is critical for drawing businesses, particularly fast food restaurants, to bypass areas. A package of traveler amenities (i.e., restaurants, gas stations, and motels) is usually needed to make new interchanges viable locations for traveler services.[11]

- **Wisconsin.** A state study found that the cost of infrastructure at new bypasses outweighs expected revenues from businesses.[12]

Specific Examples

- **Fort Wayne, IN**. New bypass interchanges needed infrastructure to make them viable as locations for economic development. In part, this was due to the lack of residential base near the bypass to support retail.

- **Danville VA.** A lack of water and sewer infrastructure impeded development along a new bypass.

Economic impacts may be determined by the ability of communities to extend political boundaries to include the land near bypasses. This allows communities to tax or restrict economic development. Extending boundaries is often a prerequisite for providing adequate water, sewer and complementary roadway infrastructure near bypasses.

Specific Examples

- **Sturgeon Bay, WI**. The town maintained its retail and commercial sector following the opening of a bypass because the town restricted development along bypass corridor. According to one official interviewed, "you can shut down downtown" without these restrictions. The town had jurisdiction over the bypass area as well as downtown, so it could impose such restrictions. Local officials thought the economic

10 *Buffington, Jesse L. and Womack, Katie T*

11 *Hartgen, et. al.*

12 *Collins, Margaret and Weisbrod, Glen; Wisconsin Department of Transportation, The Economic Impacts of Highway Bypasses on Communities.*

impact might have been different had the bypass been constructed in a municipality that competes with Sturgeon Bay for local tax revenues.[13]

- **Rice Lake, WI.** The town annexed land and defined zoning before the bypass was constructed. This allowed the community to raise revenues to build complementing infrastructure.[14]

3. Characteristics of Local Economy (Business Mix in Pre-Bypass Communities)

The mix of businesses in bypassed communities is an important indicator of the positive and negative economic effects of new bypasses. Areas that depend on pass-through traffic are at greater risk of economic losses because they lack stable regional economic bases, strong local customer markets, and major regional attractions and institutions. The literature shows that bypasses reduce truck traffic and relieve downtown congestion significantly. This provides easier driving in the downtown, improved residential conditions and more leisurely shopping. Communities that are able to take advantage of these changes will benefit. In some cases, bypasses seem to exacerbate economic trends already underway and facilitate what would have been an inevitable restructuring.

General Research Findings

- **Texas.** Bypassed areas lose their status as regional trading centers. Initial declines in local business sales are offset by a reorientation of stores from regional to local needs.[15]

- **Iowa.** Travelers made up a lower proportion of local business in bypassed communities than was assumed prior to construction of the bypasses. The bypasses increased sales due to local residents taking advantage of easier access to businesses as a result of less traffic congestion, improved traffic safety, and easier parking.[16]

Specific Examples

- **Stonewall, OK.** The bypass did not impact the local economy in Stonewall, where the downtown serves a local customer base. Although several merchants changed the orientation of their businesses, the downtown economy did not suffer after the bypass opened.[17]

13 *Wisconsin Department of Transportation," Highway Bypasses: Wisconsin Communities Share Their Experiences."*

14 *Wisconsin Department of Transportation, "Highway Bypasses: Wisconsin Communities Share Their Experiences."*

15 *Andersen, S. Johann, et. al*

16 *Anderson, Connie and Otto, Daniel. "The Economic Impact of Rural Highway Bypasses: Iowa and Minnesota Case Studies," Office of Advanced Planning, Iowa Department of Transportation, 1991.*

17 *Rogers, Cynthia and Marshment, Richard S.*

- **Rosalia, WA.** The downtown serves a local and a regional market. The bypass created a quieter, safer environment along Main Street. This environment helped attract new residents from Spokane, which is 30 miles away.[18]

- **Rice Lake, WI.** The Rice Lake bypass relieved what was described as "extreme downtown congestion" without harming the local economy. Rice Lake is 60 to 100 miles from other business and retail centers.[19]

- **Berrima, Australia.** The area's tourist economy has done well since the removal of heavy traffic from local roads. Previously, trucking and through traffic had detracted from the historic charm of well-preserved colonial buildings.[20]

Bypassed communities that are oriented overwhelmingly towards travel-related services can experience very negative impacts and may require economic restructuring.

General Research Findings

- **National.** In an NCHRP survey of traffic-serving businesses, 49 percent of firms reported experiencing negative impacts from bypass construction, 30 percent reported positive impacts and 22 percent reported no impacts. These results are consistent across small, medium, and large communities. However, the number reporting "no impact" is distinctly lower in large communities than in small and medium-sized communities. This is likely due to the larger local customer base in these communities.[21]

- **Iowa and Kansas**. Bypasses do not impact traveler-serving businesses equally. Service stations, convenience stores, motels, and small cafes are most likely to experience sales declines when new bypasses open.[22]

18 *Gillis, William R.*

19 *Wisconsin Department of Transportation, "Highway Bypasses: Wisconsin Communities Share Their Experiences," 1988.*

20 *Canberra Bureau of Transport and Communications Economics, "Economic Benefits of Investment in Transport and Communications Infrastructure: Berrima and Mittagong Bypasses," 1994.*

21 *Buffington, Jesse L. and Womack, Katie T., "Effects of Highway Bypasses on Rural Communities and Small Urban Areas," National Cooperative Highway Research Program, 1995.*

22 *Burress, David, "Impacts of Highway Bypasses on Kansas Towns," Kansas Department of Transportation, 1996. and Wells, Steve and Farnworth, Todd. "Economic Impacts of Highway Bypasses on Small Communities – A Review" Development Authority of the North Country, 2001.*

Specific Examples

- **Rosalia, WA.** A reduction in downtown traffic resulted in fewer drive-up customers at gas stations, eating places and other highway-oriented businesses. The downtown also lost service jobs. However, the bypass likely exacerbated an economic decline that would have occurred without the bypass.[23]

- **Mittagong, Australia.** The bypass led to an overall economic decline due to impacts on traffic-oriented businesses in town.[24]

- **Rush Springs, OK.** Regional development moved to the highway bypass at the expense of downtown. Three factors influenced the decline of downtown: the new bypass, the oil-bust in Oklahoma and two new Wal-Marts (eight and 13 miles from Rush Springs). However, one official stated that the "town might have dried up anyway."[25]

- **Richmond, VA.** After construction of the bypass, malls opened along the new highway and the downtown lost two major department stores. However, the market for office space remains strong in the downtown.[26]

- **Fort Wayne, IN.** The downtown was devastated by malls along I-69 following construction of the bypass. The city is struggling to reinvent itself as a corporate center for business and financial services, and as an education and cultural center.[27]

Specific destinations (e.g., homes, employment centers, schools, government offices, parks, churches, hospitals, cultural institutions, businesses, and stores) attract traffic and act as buffers against negative economic impacts associated with traffic rerouting. Bypasses tend to be beneficial for communities that contain desirable destinations by relieving congestion and facilitating access to the destinations. This is particularly true when bypasses enhance tourist destinations by decreasing truck traffic and moderating congestion. Communities oriented toward tourists prior to the construction of bypasses experience positive or no economic impact.

General Research Findings

- **Wisconsin.** Destinations in medium and large communities attract traffic. In Wisconsin, all medium and large communities had more

23 *Gillis, William R..*
24 *Canberra Bureau of Transport and Communications Economics.*
25 *Rogers, Cynthia and Marshment, Richard S.*
26 *Economic Development Research Group.*
27 *Economic Development Research Group.*

traffic after bypasses were built than before. The old routes are strongly oriented towards serving locally traffic. Seventy-six (76) percent of survey respondents said that they had origin or destinations within cities. Sustained average daily traffic (ADT) measures indicate that traffic-dependent retailers did not need to move.[28]

- **Iowa**. Retail businesses that serve repeat customers benefit from improved downtown shopping environments (e.g., reduction of truck traffic and less overall traffic than otherwise without bypass).[29]

- **Washington State.** A general study of bypassed communities in eastern Washington State shows that downtowns with well-developed local customer bases are affected less adversely by bypasses than communities highly dependent on drive-by traffic.[30]

Specific Examples

- **Omak and Okanogan, WA.** The two towns (combined population of 6,500) have city limits separated by only several hundred yards. The SR-97 Bypass of Omak and Okanogan did not result in major business closings or empty storefronts. The towns include a long-time center for trade and services within the region and the county seat. The towns also have strong ties to nearby a Native American tribe. These factors generate a significant base of retail and service industries, a mix of highway-dependent and non-dependent businesses serving both local and regional customers. Prior to the bypass, downtown businesses were not heavily focused on drive-by traffic. However, businesses that were dependent on drive-by traffic closed after the bypass opened. New businesses that focused on the local customer base filled the vacancies left in downtown.[31]

- **Richmond, VA.** The growth in tourism accelerated after bypass construction. Activities include a convention center expansion as well as development of a canal walkway. In addition, a downtown medical school led to the development of a biotech park.[32]

- **Others**. Tourism benefits are seen in evaluations of bypasses for ***Sturgeon Bay*** and ***Rice Lake, WI; Richmond, VA***; and ***Berrima,***

28 *Wisconsin Department of Transportation, " The Economic Impacts of Highway Bypasses on Communities," 1998.*

29 *Anderson, Connie and Otto, Daniel, "The Economic Impact of Rural Highway Bypasses: Iowa and Minnesota Case Studies," Office of Advanced Planning, Iowa Department of Transportation, 1991*

30 *Gillis, William R..*

31 *Gillis, William R..*

32 *Economic Development Research Group.*

Australia. Bypasses constructed around Sturgeon Bay and Rice Lake relieved extreme downtown congestion during the summer tourist season. Before the Rice Lake bypass, tourists could not cross Main Street due to heavy traffic.[33]

Declines in downtown retail may be part of general economic shifts unrelated to bypass construction. However, bypasses can exacerbate inevitable economic restructuring between towns and their surrounding areas. Prior economic stability is an important indicator of how well communities fare after bypasses are in place.

General Research Findings

- **National.** Downtowns already affected by shopping mall development in 1970s and 1980s probably have already restructured to office and cultural economies. Although older, "main street" business districts might experience declines concurrent with bypass construction, other causal factors may be at work, such as the attractiveness of modern buildings and amenities that happen to locate along bypasses.[34]

- **Kansas.** A statewide study concluded that national and regional population/employment trends are more important than the construction of bypasses as a predictor of economic change. In addition, the overall economic climate is an important consideration. Economic downturns affect travel-related businesses regardless of bypass construction.[35]

- **Wisconsin.** A statewide study concluded that economic growth, which generates traffic, is often a driving reason for building bypasses, and that the construction of bypasses does not change these trends.[36]

- **Kentucky.** Overall, downtowns without bypasses are healthier office markets than downtowns that have been bypassed. A University of Kentucky study compared downtowns with bypasses to a group of towns without bypasses, and measured office vacancy rates of 18.4 percent in bypassed downtowns and 10.9 percent in towns without bypasses.[37] This may be due to the development of modern office facilities along the bypasses.

33 *Wisconsin Department of Transportation, Economic Development Research Group and Bureau of Transport and Communications Economics.*

34 *Buffington, Jesse L. and Womack, Katie T. and Wells, Steve and Farnworth, Todd, "Economic Impacts of Highway Bypasses on Small Communities – A Review," Development Authority of the North Country, 2001.*

35 *Burress, David.*

36 *Wisconsin Department of Transportation, "The Economic Impacts of Highway Bypasses on Communities."*

37 *Thompson, Eric, et. al., "The Impact of a New Bypass Route on the Local Economic and Quality of Life," Kentucky Transportation Center, University of Kentucky, 2001.*

Specific Examples

- **Danville, VA.** The bypass may have exacerbated a trend already underway to restructure downtown Danville from retailing into an office center.[38]

- **Appleton, WI**. Downtown restructured into a cultural center with a strong financial services sector. The curtailment in retail investment started before the bypass was planned. Some redevelopment was funded by public financing. However, the bypass has spawned retail growth with negative impacts on the small towns surrounding Appleton.[39]

- **Rice Lake, WI.** Although Rice Lake's commercial district thrived after bypass construction, the town lost some retail establishments. An evaluation of the bypass indicated that downtown merchants would have been hurt anyway by mall construction at the edge of the city.

- **Prosser and Sunnyside, WA.** Each town had well-developed downtown business districts prior to construction of the bypass. After the bypass, the overall commercial vacancy rate for the towns stood at 5 percent. There was little impact from the bypass on these communities. As a possible consequence of the bypass, the business mix in the downtowns shifted from retail to professional services and government offices. In addition, residential development increased near the downtown, as a consequence of quieter conditions (which may create more retail opportunities in the future).[40]

4. Traffic Characteristic (Pre-Bypass Origin-Destination and Trip Purpose)

High average daily traffic (ADT) and truck traffic may inhibit tourism. In these cases, bypasses may remove trucks and excess traffic, which increases the attractiveness of communities as tourist destinations. Relieving extreme congestion, lessening fast-moving through traffic, and reducing the number of trucks tends to enhance local traffic safety and ameliorate air pollution. This will also increase the attractiveness of communities for businesses and residents. The presence of significant local traffic suggests that merchants rely on local customers and that bypasses will have limited impacts. The adequacy of downtown parking and access to towns after bypasses often indicate how well communities can compete with lands made accessible by bypasses.

38 *Economic Development Research Group.*

39 *Collins, Margaret and Weisbrod, Glen, "Economic Impact of Freeway Bypass Routes in Medium Size Cities," 2000.*

40 *Gillis, William R.*

General Research Findings

- **National.** The removal of heavy truck traffic from central cities led to positive impacts by encouraging more local traffic.[41]

Specific Examples

- **Omak and Okanogan, WA**. One reason that SR-97 Bypass did not affect the towns' roles as a regional center for trade and services is that State Route 215 still passes through town. The towns enjoyed a stable regional commercial base, resulting in both local and regional customers, and moderately high ADT flowing from other highways.[42]

- **West Bend, WI.** US 45, the bypassed road, provides an efficient route for the movement of goods and services through the city and makes the city more accessible to cargo traffic. By relieve trucking and other congestion, the bypass helped downtown develop a shopping area.[43]

- **Danville, VA**. The bypass did not result in a decrease in ADT, but it significantly reduced truck traffic. Drivers who avoided the city due to truck traffic began driving in the city, and there were no negative business impacts. The mall near the end of bypassed route was not affected and is expanding. The bypass is thought to have helped the mall by encouraging more local traffic.[44]

- **Richmond, VA**. I-295 has not led to reduced traffic on I-95. The bypass carries less than 20 percent of local traffic. Equal proportions of trucks use the old and new routes. The old road retained the official name of highway (I-95), which assisted in sustaining traffic volume. This also encouraged businesses to remain. I-95 was previously a toll road. Tolls were eliminated after the bypass opened, which encouraged traffic growth.[45]

- **Fort Wayne, IN**. A dip in traffic followed the opening of the bypass and a significant amount of truck traffic diverted to the bypass. Although traffic along the old highway rebounded to pre-bypass levels, the city's retail sector was devastated after the bypass opened.[46]

41 *Buffington, Jesse L. and Womack, Katie T.*

42 *Gillis, William R.*

43 *Wisconsin Department of Transportation, "The Economic Impacts of Highway Bypasses on Communities."*

44 *Collins, Margaret and Weisbrod, Glen.*

45 *Collins, Margaret and Weisbrod, Glen.*

46 *Economic Development Research Group.*

- **Berrima, Australia**. The elimination of heavy vehicle traffic contributed to the ambiance for tourists by making walking safer and easier.[47]

Some bypasses provide faster or easier regional access to bypassed areas and reduce shipment times for local businesses.

Specific Examples

- **Sturgeon Bay, WI**. The bypass helps businesses save on truck shipment times by up to one-half hour. The bypass enhanced public safety as a result of the reduction in congestion, particularly in summer.[48]

- **Mittagong, Australia.** Traffic on the old Hume Highway declined substantially after the bypass opened. However, the overall decline in traffic is less than predicted due to larger stream of regional traffic connecting through Bowrel Road.[49]

- **Rice Lake, WI.** The bypass eliminated extreme congestion in the downtown and the commercial district is thriving after the opening of the bypass.[50]

5. Demographics

Population is a powerful predictor of how well bypassed areas fare after the opening of bypasses. The size of the local consumer market and the relative isolation of towns are linked with population as indicators of how bypasses will impact the community.

General Research Findings

- **National.** An NCHRP study of 141 bypasses confirms that population is an important indicator of whether communities are susceptible to economic impacts from bypasses. Approximately half of the sample (71 out of 141 communities) consisted of very small towns with populations less than 5,000. Ten of the 141 bypassed communities had negative impacts overall, and seven of these were in small communities.[51]

- **Wisconsin.** Over time, traffic in large and medium-sized, bypassed communities grew to equivalent levels or greater than pre-bypass

47 *Canberra Bureau of Transport and Communications Economics*

48 *Wisconsin Department of Transportation, "Highway Bypasses: Wisconsin Communities Share Their Experiences."*

49 *Canberra Bureau of Transport and Communications Economics.*

50 *Wisconsin Department of Transportation, "Highway Bypasses: Wisconsin Communities Share Their Experiences."*

51 *Buffington, Jesse L. and Womack, Katie T.*

counts. Economies of very small communities (less than 2,000 residents) have a greater potential to be adversely affected by bypass construction. Over time, traffic levels in communities with population greater than 2,000 are close to pre-bypass levels.[52]

- **Minnesota.** A statewide study confirmed that the distances of bypasses from towns and distances between towns are important indicators for health of bypassed areas.[53]

- **Iowa.** A statewide study suggested that communities of 2,000 or more people and separated from competing urban centers by more than 25 miles will not suffer retail losses as a result of bypass construction. Multiple factors are needed to predict the retail impact in communities with populations between 500 and 2,000. Communities with populations of less than 500 depend the most on through traffic and are most likely to suffer economically from bypasses.[54]

52 *Leong, Dennis and Weisbrod, Glen, "Summary of Highway Bypass Studies," Minnesota Department of Transportation and Wisconsin Department of Transportation, 1999*

53 *Anderson, Connie and Otto, Daniel.*

54 *Anderson, Connie and Otto, Daniel.*

CALIFORNIA CASE STUDIES

As part of the California Bypass Study, the project team conducted case studies of California bypasses. This section describes the process for collecting case study data. Caltrans planners and engineers may want to follow a similar process when considering the economic impacts of future bypasses.

This section also presents findings from the California case studies as a series of best practices and lessons learned. Generally, these findings mirror those found in the academic literature. These findings should help Caltrans planners and engineers identify policies and design features that mitigate negative economic impacts from future California bypasses.

Towns Visited and Data Collected

Caltrans Office of Advanced Planning identified four completed bypass and ten proposed bypasses for inclusion in the study. The project team visited local communities for each bypass. In the case of Sonora, the project team discovered that the Sonora Bypass was constructed prior to the recent East Sonora Bypass. While the focus of the visit was the East Sonora Bypass rather than the Sonora Bypass, the case study discusses some impacts of the earlier bypass. The project team also spoke with individuals about the Roseville Bypass, which opened to traffic in 1987. While Roseville was not visited as part of the case studies, some of the lessons learned from Roseville are included in this handbook.

A second volume of the report provides detailed case studies of approximately 30 pages for each bypass visited. Caltrans planners and engineers may wish to refer to these case studies when working on similar bypasses. Exhibit 3 summarizes key attributes for the bypasses to help planners and engineers select appropriate case studies.

Exhibit 3
California Bypasses Visited During Study

Bypass	Location (Route and County)	Nature of Community	Motivation for Bypass	Illustrates
Completed Bypasses				
Cloverdale Bypass (1995)	US 101 in Sonoma County	Regional center & residential community	Inter-regional traffic & congestion	Advanced planned and redevelopment allowed local economy to recover.

Bypass	Location (Route and County)	Nature of Community	Motivation for Bypass	Illustrates
Hollister Bypass (1997)	SR-156 in San Benito County	Agricultural & residential community	Traffic congestion, trucks & safety	Bypass did not hurt local agricultural and bedroom community economy.
Mojave Bypass (2003)	SR-58 in Kern County	Highway-serving town	Inter-regional traffic	Bypass design and community input are important.
Sonora Bypass (1987)	SR-108 in Tuolumne County	Regional retail center & institutions	Traffic congestion	Downtown has become a tourist destination.
Truckee Bypass (2002)	SR-267 in Nevada County	Tourist-oriented community	Traffic congestion	Community concerns were addressed in design and construction.
Proposed Future Bypasses				
Angels Camp Expressway	SR-4 in Calaveras County	Agricultural & residential community	Traffic congestion & trucks	Bypass serves inter-regional traffic, while economy focuses on local residents.
Bishop Bypass	US 395 in Inyo County	Highway-serving & government center	Traffic congestion, trucks & safety	Town serves highway traffic and travelers have few other options.
Brawley Bypass (Stages 1 through 3)	SR-78 in Imperial County	Agricultural community	Inter-regional traffic, trucks	Bypass provides access to land for residential and economic development.
Hopland Bypass	US 101 in Mendocino County	Winemaking & tourism	Inter-regional traffic	Bypass may help community turn into a tourist destination.
Kramer Junction Expressway Realignment	SR-58 in San Benito County	Retail service stop	Inter-regional traffic	Bypass may not hurt local businesses due to location, design, and services.
Lockeford/Clements Bypass	SR-88 in San Joaquin County	Agricultural community	Traffic congestion	Community does not cater to traffic and is unlikely to be affected.
Pine Grove	SR-88 in Amador County	Small town	Traffic congestion	Bypass likely to have little economic impact.

Bypass	Location (Route and County)	Nature of Community	Motivation for Bypass	Illustrates
East Sonora Bypass	SR-108 in Tuolumne County	Regional retail center & institutions	Ease traffic congestion	Development can occur along bypass.
Sutter Creek Bypass	SR-49 in Amador County	Tourist destination	Develop pedestrian-friendly street	Tourist-oriented town may benefit from bypass construction.
Willits Bypass	US 101 in Mendocino County.	Lumber & regional retail center	Inter-regional traffic	Bypass design may mitigate some bypass impacts.

The Sonora and East Sonora case study is a combination of completed and proposed bypasses and offers lessons for both. The Roseville Bypass, which is not listed in the above table, was coupled with extensive residential and office park development and is unlike other bypasses proposed in California. Providing access to open land was a much a motivation for the Roseville Bypass as bypassing the existing community. The most comparable bypass to the Roseville example is the current Brawley Bypass, although less extensive development is currently expected.

General Findings

The case studies reiterate lessons learned from the theoretical review. In general, bypasses impact the local economy as a function of the type of traffic addressed. Businesses in communities with heavy local traffic or with through traffic that does not stop will not be impacted. Communities that provide services to pass-through traffic are more likely to be impacted. The critical issue is whether travelers had planned to stop ahead of time or tend to make opportunistic stops. If most through travelers had planned to stop, then the bypass design should try to maintain the convenience for travelers to stop (i.e., easy interchanges, bypass near businesses, etc.). If business comes mainly from travelers that stop on a whim, the solutions for maintaining business include finding ways to advertise to travelers (i.e., placing bypass within sight of businesses, providing signage on the bypass, etc.) or to move businesses near the bypass (providing convenient interchanges, providing inducements for businesses to move, etc.).

The next several bullets highlight a number of issues that planners, engineers, local business leaders, and local government should consider in planning and designing bypasses. The findings are provided in question and answer format.

What types of towns are impacted economically?

- Highway-oriented towns (e.g. Mojave and Kramer Junction) have a much harder time transitioning their economies after bypasses are

constructed than those that cater to local residents or offer tourist attractions.

- Towns that serve residential communities (e.g., Cloverdale and Hollister) or tourist destinations (e.g., Sonora, and Truckee) can benefit from reduced traffic and improved safety as a result of highway bypasses. Local government and the business community may need to engage in complementary efforts, such as marketing, downtown redevelopment, additional parking, and sidewalk improvements, to take advantage.

- Towns that serve regional markets by providing services, such as big box retail, automobile dealers, department stores, or hospitals, may experience little or no economic impacts (e.g., Sonora). If a bypass provides better access to regional services, the local economy may actually improve as the town expands its regional draw.

- Towns with other economic bases, such as government employment, mining, agriculture, manufacture, etc. are not likely to be economically impacted by bypasses. For example, the Brawley Bypass is unlikely to hurt the local agricultural base and may improve goods movement. Bishop serves as a regional government center.

Which businesses are impacted?

- Gas stations and quick service or fast food restaurants cater the most to pass-through traffic. They are most likely to be impacted by the diversion of traffic due to bypasses.

- Other visitor-serving businesses, such as motels, art galleries, antique stores, and curio shops, cater more to visitors attracted to the community as a destination rather than those simply passing through. These businesses are less likely to be negatively impacted by bypasses and may find that business improves if the downtown is turned into a destination.

- Regionally serving businesses, such as big box retail and departments stores, may benefit from improved access.

- Businesses that serve local residents, such as drug stores, banks, and grocery stores are generally not impacted by bypasses.

What other impacts occur?

- Bypasses often have a short-term (and negative) impact on the local economy, but retail sales often improve in the longer term (e.g., Cloverdale). However, some communities may never fully recover (e.g., Mojave).

- The construction of a bypass may also provide an opportunity for revitalization of the local community (e.g., Brawley).

- Bypasses are often promoted as improving pedestrian safety along Main Street. Since traffic accidents involving pedestrians are relatively rare events, Caltrans collision statistics may not reflect improved safety. However, bypasses may improve the perception of safety, which is a benefit in its own right.

What design features are most important?

- Visibility. Negative economic impacts (losses of customers and sales) are likely to be small for businesses that remain visible from bypasses. In some cases, the goal of making downtowns visible from bypasses may conflict with the desire to protect communities from noise and visual impacts. Caltrans can provide some "visibility" for businesses through signage.

- Distance from downtown. Bypasses located close to existing downtowns are less likely to hurt local economies. Travelers may be able to see businesses and access times are shorter if bypasses are nearby.

- Direct access. Highway interchanges can provide direct access from bypasses to downtowns and existing businesses. However, interchanges can also encourage the development of competition to existing businesses by offering new "prime" locations.

- Time savings. The difference in travel time between the old route and the new bypass determines how many vehicles (and potential customers) divert to the bypass.

What can Caltrans do?

- The issue of signage came up in several case studies. Local communities offered several suggestions on how Caltrans can provide signs that may mitigate negative economic impacts. For example:

  - Caltrans could provide signs indicating services are available at the next exit. Some businesses have offered to pay for

signs, but Caltrans districts have raised a concern whether the Department can be involved in "advertising" for specific businesses.

- Caltrans could designate the existing route as a "scenic or historic" route to encourage tourist traffic. However, this must fit within the Department's guidelines for such designation.

- The bypass could be designated as a bypass route, while the original route retains the State Route designation. This may conflict with the State's policy to avoid parallel routes.

- The large lag between initial planning and engineering and construction may cause businesses and residents not to believe that bypasses will eventually be built. The availability of funding and regional priorities are beyond Caltrans' control, but Districts should try to keep the public actively involved, remind residents and businesses about planned bypass, and help the community plan for the transition.

- In some case studies, businesses had made no plans to adjust their business strategies to take advantage of planned bypasses. Caltrans can work with local governments and chambers of commerce to encourage businesses to plan early for bypasses. Businesses may choose to market to local residents, change their line of business, or relocate.

- Caltrans should continue to recognize the need to conduct early analyses of impacts on tribal governments, facilities, and economies. Districts need to consult in the earliest planning stages and on an on-going basis with the Native American communities as critical stakeholders for transportation planning.

What can local communities do?

- Local communities can take advantage of reduced general and truck traffic along Main Street by engaging in redevelopment activities, such as main street programs, the provision of benches, planting and improved sidewalks, economic development incentives and grants, providing parking facilities, etc. For example, Cloverdale had a redevelopment strategy that included these elements.

- Communities can provide roads, utilities, and other infrastructure at interchanges along the bypass to attract businesses and encourage the relocation of traffic-dependant businesses, such as gas stations and fast food restaurants.

- If a bypass remains outside of the local jurisdiction, a town can annex territory to make sure that any economic development remains inside the local tax base. Alternatively, the local community can zone the area or withhold utilities and infrastructure, so developments that compete with downtown do not occur.

- Local governments and chambers of commerce can work with local businesses to develop business plans that take into account the change in traffic due to bypasses. For example, the Calaveras County Chamber of Commerce is trying to encourage Angels Camp businesses to develop new business plans.

- The community should have a vision of how the bypass will be integrated into the local environment (e.g., transportation flow, redevelopment, visual impact, economics, etc.). For example, Brawley has a vision for the downtown. Truckee does not have a redevelopment plan, because the town already had tourist-oriented development.

What are other issues to consider?

- A bypass is more likely to be received positively if it is proposed by the local community than if it is motivated by inter-regional highway plans.

- Caltrans planners and engineers should recognize that the motivations for supporting a particular bypass may differ between Caltrans and the local community (public and government):

  - For Caltrans, the focus is on through traffic and safety issues. Caltrans typically builds bypasses to implement infrastructure plans (convert conventional highway to expressway or freeway), address mobility issues (improve traffic flow, improve level of service for inter-regional traffic, address operational issues), or mitigate safety problems.

  - For the local community, the focus is on local traffic and the impacts on downtown. The local community often expects bypasses to address problems with truck traffic (eliminate noise, dirt/dust, and safety perceptions), mobility (improve level of serve, help local circulation, reduce idling noise in downtown), and traffic control (improve appearance of traffic control measures, hold community festivals, etc.).

- Local communities often resist accepting relinquishments until significant improvements are made. However, the relinquishment of Main Street to local control is an enticement in some cases.

- Traffic signals can address local circulation issues in rural communities, but may not address long-term issues with through traffic.

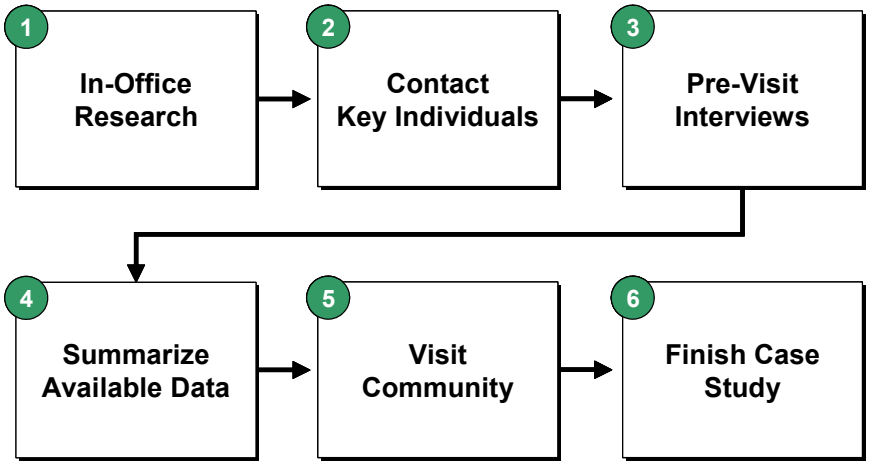
- Bypasses may be unable to solve local circulation problems. Caltrans planners and engineers need to consider whether congestion needs to be addressed through State Highway bypasses or improvements in local roads. For example, many rural California communities have only a single route through town and parallel local roads may be needed (e.g., Angles Camp, Bishop, and Sonora).

Later sections provide details on the retail sales, safety, and truck impacts examined in the California case studies.

Methodology for Collecting Data

The field research conducted as part of the California Bypass Study illustrates a methodology Caltrans planners and engineers can follow for collecting information on bypasses. Prior to visiting the case study sites, the project team conducted in-office research and interviewed local representatives. During the field research, the project team conducted more interviews, examined the Main Street and bypass locations, counted businesses, and took pictures. Exhibit 4 illustrates our approach to collection information for the California case studies.

Exhibit 4: Approach to Case Studies



Step 1. The project team reviewed published reports. Important reports to consider include: Project Study Reports, environmental reviews, Route Concept Reports, and other project summaries developed for inter-regional planning. These reports provide

historical background, project justifications, and some information about the local community. The team collected traffic data and Traffic Accident and Surveillance Analysis System (TASAS) collision data from the Division of Traffic Operations as well as economic and demographic data from the Department of Finance (DOF) and the US Census Bureau. Critical economic data include employment and number of establishments from the Census Bureau's ZIP Code Business Patterns. DOF provided population trends and current demographics. The team also reviewed newspaper articles from online searches and public hearing notes as available.

Step 2. The project team contacted Caltrans staff knowledgeable about the bypasses. This was typically the project engineer, but sometimes the person with the most project history no longer worked in the District. The team explained the purpose of the study - documenting the economic impacts of California bypasses and identifying best practices and lessons learned. District representatives were asked to provide a history of local transportation issues and the bypass. They were also asked to help identify key stakeholders to interview during the site visits, such as city representatives, county representatives, chambers of commerce, local business leaders, and Native American representatives. The bypass project managers also explained the motivating factors for constructing the bypasses, potential traffic and safety impacts, and community objections. The critical lesson is to review all data available at Caltrans before contacting local representatives.

Step 3. As part of the pre-visit data collection, the project team called a number of local representatives:

- City planning department staff
- City public works and traffic engineers
- County representatives
- Chambers of commerce and the business community
- Native American and tribal representatives
- Economic development commissions
- City managers
- Regional Transportation Planning Agencies (RTPA)
- Finance directors.

The lesson for Caltrans planners and engineers is the importance of talking to community groups or neighborhood associations. Exhibit 5 provides a sample of the guide used in the interviews. Planners and engineers should ask similar questions when talking to local groups.

Exhibit 5: Questions Asked During Bypass Interviews

- Nature of community (size, special features)
  - Future plans (attract more tourists, stay same size)
  - Economic and traffic information (what drives economy, how economic base has changed, local traffic data)
- Nature of bypass
  - Reason for bypass
  - Community perspectives about bypass (local leader opinions, objections raised, perspectives after completion)
  - Other factors (infrastructure available, development plans, political issues)
- Impacts (traffic, safety, local business, general economy, downtown, environment, development along bypass)
  - For proposed bypasses, possible impacts and community concerns
  - For completed bypasses, what happened?
- Wrap-Up
  - Do you have documents we should review? (mail or we will pickup)
  - Mention field visit and set a time to meet
  - Who else do you suggest contacting?

The project team also tried to collect published documents and data prior to visiting the bypass sites, including:

- General plans
- Economic studies (economic development and cluster analyses)
- Traffic studies (counts, forecasted impacts, and origin-destination surveys)
- Consultant studies (e.g., sponsored by local chambers of commerce)
- Tax receipts or other data that substantiates business impacts.

Step 4. Before visiting each site, the project team prepared rough situation summaries to identify gaps and data to be verified during the field visits. The team also identified the location of businesses likely impacted by shifts in pass-through traffic (e.g., gas stations, restaurants, motels and hotels) using information from market research firms. Several firms provide comparable market information, including InfoUSA and Dunn and Bradstreet.

Step 5. During each field visit, the project team conducted windshield surveys of the downtown and, in the cases of completed bypasses, the bypass site. The team walked the bypassed corridor and verified the market research information on the locations of business establishments. In some cases, businesses had moved or turned over. The project team also met with the representatives contacted earlier. Other activities included: examining available parking, observing traffic in the downtown, talking with local residents, and taking pictures. The lesson learned for Caltrans planners and engineers is the need to verify businesses along the bypassed corridor rather than relying on published sources.

Step 6. After returning from the field visits, the project team compiled available information to identify the overall impacts of the bypasses, strategies (e.g., designs,

complimentary policies, etc.) that led to successful outcomes and lessons that could be learned for future California bypasses.

The case studies provide an example of how detailed economic analyses can be written. They show that local communities are most frequently concerned about the potential loss of businesses and accompanying jobs. They also show how economic impacts can be estimated. The following factors are critical for estimating the economic impacts of bypasses on bypassed communities:

- Extent of specific types of businesses bypassed (visitor and pass-through traveler serving businesses, commercial establishments, local-serving commerce, regional-serving commerce, industry, and office)
- Lost traffic
- Extent to which trip purposes (as collected in travel surveys) suggest that traffic will leave rather than continue to use local businesses
- Potential for development in areas made accessible by bypasses.

The HBI Model, described later in this report, helps estimate the range of gains, losses, or shifts in jobs associated with highway bypasses given the nature of the bypasses, relevant traffic, and local settings. The case studies also point to quality of life impacts that can be evaluated as direct consequences of road design, such as delay improvements, reduced delays, elimination of traffic backups, and fewer trucks on residential streets. However, other quality of life improvements, such as sprawl, infill development, truck noise, air quality and perceptions of pedestrian safety can evaluated in qualitative terms only after discussions with local experts, community groups, and business associations about zoning, available infrastructure, and development plans.

Retail Sales

The project team looked at retail sales for four completed bypasses (i.e., Cloverdale, Hollister, Roseville, and Truckee) to see if impacts or trends could be identified. The team was unable to consider the impacts in Mojave because the community is unincorporated and the bypasses opened to traffic too recently for published data to be available. However, anecdotal evidence suggests that the bypass had negative impacts on local businesses. Sonora was also excluded from the analysis because the bypass opened nearly two decades ago and the case study had focused on the recent East Sonora Bypass.

The team conducted an "in-office" analysis by examining retail sales for each town as a whole. Due to limits in the data available from published sources, we could not consider whether the bypasses shifted business from the downtowns or the existing routes to new locations within the towns. The project team also did consider whether business ownership is local or national, which is often a factor for local stakeholders.

Data Available

The project team was able to collect taxable sales information for three industries of interest:

- Eating and drinking places
- Service stations
- Food stores.

The project team chose the first two because they are likely to serve pass-through traffic in addition to local residents. Food stores were added because they may have trends similar to eating and drinking places, but are more likely to serve local residents than pass-through traffic. Due to data reporting limitations, the project team could not get industry-specific data for Roseville and had to settle on sales for an "all retail" industry. Data were not available for Mojave because it is unincorporated.

The project team also wanted to get information on accommodations (i.e., hotels and motels), since they are likely to serve pass-through traffic. However, accommodations are not subject to sales tax and transient occupancy taxes for accommodations are levied at the local level. The team tried to collect transient occupancy tax information from local and county governments during the site visits, but this information was not universally available.

The project team consulted a number of sources to collect retail sales and other information for the analysis:

- Retail sales figures from the California Board of Equalization (BOE)

- On-line reports, 1999 to 2004 (see www.boe.ca.gov/news/tsalescont.htm)

- Published data, pre-1999 from the MTC Transportation Library

- National GDP deflator statistics from the Fiscal Year 2005 Budget of the United States Government: Historical Tables, Table 10.1 (see www.gpoaccess.gov/usbudget/fy05/sheets/hist10z1.xls

- Population estimates from the California Department of Finance (DOF), see www.dof.ca.gov/HTML/DEMOGRAP/repndat.htm.

Data Analysis and Findings

The project team converted nominal retail sales into real retail sales (in Year 2000 dollars) using the GDP deflator. For each bypass, the project team graphed real retail sales over a ten-year period that spans five years before and five years after the bypass

opened. We noticed that retail sales rose over time for many of the bypasses and realized that much of this growth might be due to population increases.

The project team divided retail sales by DOF population figures, but found that the per capita sales graphs showed trends similar to general economic booms and busts. The overall economy improved from 1995 to 2001, and so did retail sales. The per capita sales figures could reflect industry-specific factors (such as gasoline cost increases for service stations) that are unrelated to construction of the bypasses. To adjust for general economic and industry-specific trends, project team decided to divide local per capita sales by comparable statewide per capita sales. The project team calculated ratios for each industry and bypass. The resulting ratios show changes that occur regardless of inflation, population growth or underlying economic trends.

Exhibit 6 summarizes the impacts for the four bypasses examined. As the exhibit shows, the impacts of the bypasses on retails sales were mix. Sales improved in some cases, while they declined in others.

Exhibit 6: Summary of Impacts

Bypass	Primarily Local-Serving Industry	Pass-Through Serving Industries	
	Food Stores	Eating and Drinking Places	Service Stations
Hollister	+	=	=
Truckee	-	-	-
Cloverdale	"All retail" +		
Roseville	-	- or =	+

Key: - Declining Retail Sales = Steady Retail Sales + Increasing Retail Sales

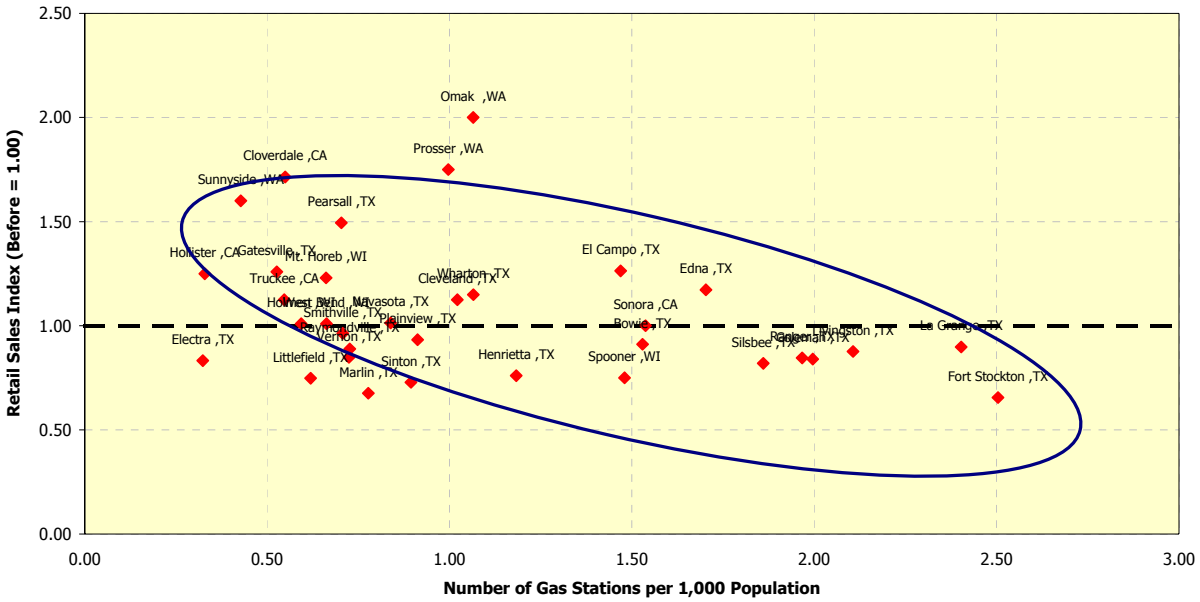
Although our initial intent in calculating local-to-state sales ratios was to compare sales before and after bypass openings, the project team noticed that the ratios reflect fundamental differences in the economies of the bypass areas. For example, the sales ratios for service stations and eating and drinking places in Hollister tend to range in a from 0.6 to 0.8, while comparable figures for Truckee exceed 1.4 and range as high as 2.7. Per capita sales in Hollister tend to be less than statewide averages, while sales in Truckee far exceed these averages. This result makes sense, since Truckee is near several ski resorts and may serve destination (non-local) traffic. The project team tried calculating local-to-county ratios, but the trends are similar to those for local-to-state ratios.

This suggests that Caltrans could interpret the sales ratios in a manner similar to the concept of location quotients used in regional economic analysis. Location quotients

measure the strength of a region's economic activity relative to a control area, such as the state. A quotient of less than 1.0 suggests a region is underserved and is a net importer for a particular industry, while a figure above 1.0 suggests that a region is overserved and is a net exporter. Applying the same logic, a region that has a local-to-state ratio for service station sales that far exceeds 1.0 is more likely to serve pass-through and destination traffic.

In developing the HBI Model, the project team saw similar results for case studies nationally.[55] Exhibit 7 shows how sales changed after bypasses were constructed in relation to the number of services stations per capita. Communities that had relatively more services stations per capita were more likely to be hurt economically after the bypasses opened. This reinforces the idea that communities with many service stations (and high gas station sales) are net exporters of gas station services. That is, they tend to be highway oriented and hurt economically by bypasses.

Exhibit 7: Impact of Bypasses on Retail Sales as Compared to the Number of Gas Stations in Communities



Source: HDR analysis of retail sales data

The differences in the number of gas stations and sales across communities could also be due to regional consumption patterns (e.g., differences in average trip lengths and automobile usage for service stations, differences in the proclivity to eat out for restaurants, etc.). However, a high local-to-state sales ratio in pass-through serving industries may be a "red flag" indicating a community where Caltrans should pay particular attention to the potential impacts of a bypass, consider design alternatives

55 *The national bypass case study database is described further in the documentation for the HBI Model that was developed as part of this study.*

(such as interchange locations and signage), and mitigation strategies (such as facilitating downtown redevelopment).

Safety Impacts

The project team compiled a database of collision information for all completed and proposed future bypasses in the study. The database includes information from TASAS and from the California Highway Patrol Statewide Integrated Traffic Records System (SWITRS). The team also collected information from local agencies and Project Study Reports.

A review of project reports for previously constructed bypasses revealed that they are often justified on the basis of reducing highway collisions by easing conflicts between local and through traffic, particularly in downtown areas. For example, the Roseville Bypass project report sets a goal of reducing "side friction" from street intersections (Roseville Bypass Project Report, June 11, 1963). Study documents for the Mojave Bypass describe the need for "reducing congestion, driver impatience, speed restrictions, turning conflicts between business traffic with through traffic" (Mojave Bypass Supplemental Project Study Report, April 1992). Caltrans documents for other projects discuss the need to minimize sideswipes, rear-ends, and other collisions related to interactions between through and local traffic. Future bypasses are also proposed to lessen highway collisions.

Given the interest in the safety impacts of bypasses, it is useful to consider what happened in the case of some already-built bypasses in California. This section summarizes what happened for three bypasses – Cloverdale, Hollister, and Truckee. Although the project team did not find conclusive evidence that the bypasses improved safety, we also did not find evidence that they diminished safety.

Data Available

The safety database includes a combination of information from TASAS and SWITRS. Originally, the project team collected information from TASAS only, but quickly found that the electronic files have data for only ten years (1994 to 2003). Caltrans publishes an annual summary of TASAS information and these reports are available at the Caltrans library in Headquarters. The most detailed information in the published reports is at the county and district levels only, which is not sufficient for this analysis.

The project team decided to examine the CHP SWITRS database, since this is the origin of the TASAS data. SWITRS differs from TASAS in only two respects: 1) SWITRS contains information for all California roads (not just State Highways), and 2) Caltrans adds highway geometric information to the TASAS database that is not available in SWITRS.

While CHP carefully controls access to SWITRS, they publish annual reports, which are available in the Caltrans library. The published SWITRS reports provide more detail than the TASAS reports do. From the SWITRS reports, the project team was able to get information at city and county levels. Although SWITRS data are available for a number of years, the project team chose to collect data for ten years:

- For previously built bypasses, five years before construction and five years after construction
- For future proposed bypasses, the last ten years.

Analysis and Findings

In order to consider the safety impacts of bypasses, the project team could examine only bypasses with sufficient before and after data. The Roseville and Sonora bypasses, which opened to traffic in 1987, are too old for before data to be available from TASAS. Thus, the California Bypass Study includes only four previously constructed bypasses with available data:

- Cloverdale (opened in 1995)
- Hollister (opened in 1997)
- Mojave (opened in 2003)
- Truckee (opened in 2002).

Mojave and Truckee opened very recently, so we do not have sufficient after data to conduct an impact analysis for these bypasses. The Roseville and Sonora facilities have been open for more than a decade. Although this provides us with sufficient after data, the project team was unable to collect before data from TASAS. Using SWITRS data, the team could look at how the number of collisions changed at the city-level, but it would be difficult to control for the rapid growth of the community and traffic. We also considered adding information from Roseville and Sonora project reports, but it was difficult to make comparisons between this information and the TASAS data. As a result, the project team decided to focus on the Cloverdale and Hollister bypasses. A brief description of the short-term safety impacts in Truckee is included at the end of this section.

The team began by examining the total number of collisions. As shown in Exhibits 8 and 9, we found an unexpected phenomenon. For both bypasses, the number of collisions increased on the routes that were bypassed after an initial, marginal decline. After about four or five years, the number of collisions fell to or below pre-existing levels. One theory is that that new traffic patterns lead to driver confusion and more collisions. Once drivers sorted out the new route, safety benefits were finally realized. However, it seems unlikely that this adjustment period would require four to five years.

Exhibit 8: Cloverdale Bypass - Total Collisions

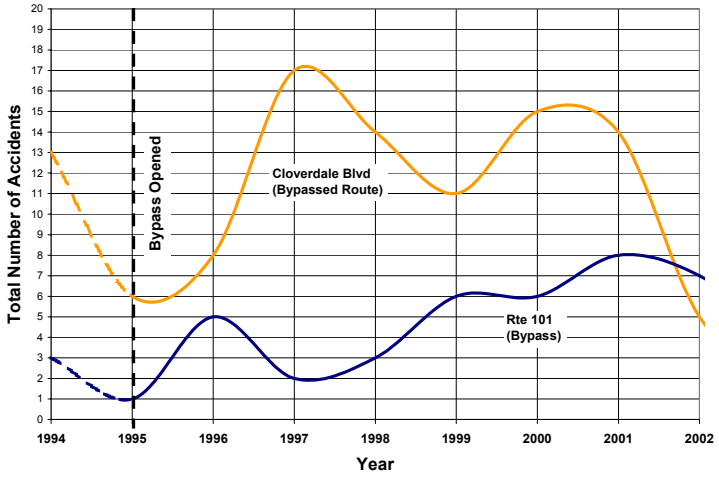
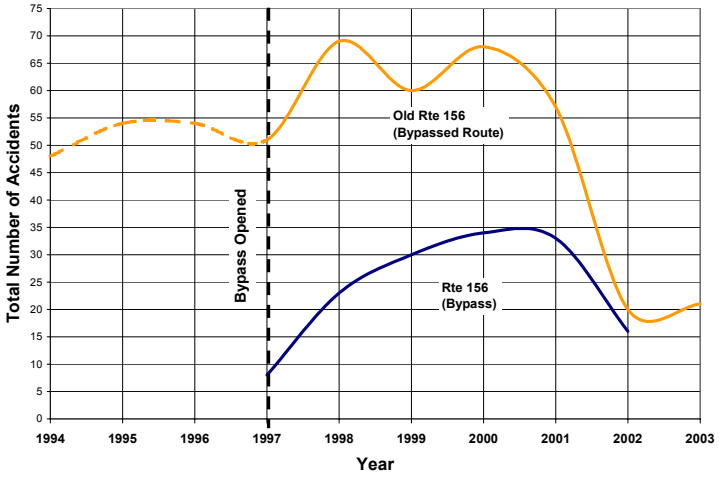


Exhibit 9: Hollister Bypass - Total Collisions



The project team decided to examine fatality and injury collisions alone. As shown in Exhibits 10 and 11, we got mixed results. For the Cloverdale bypass, the pattern for fatality and injury collisions was similar to that of collisions overall, just less pronounced. However, for the Hollister bypass, the number of fatality and injury collisions remained steady and then declined after four to five years. This suggests that the bypasses reduced the incidence of more severe collisions and increased the proportion of property damage only (PDO) collisions. Perhaps, the bypasses removed through drivers who were less familiar with the local roads and more likely to cause severe collisions, while local drivers began to drive more aggressively in the presence of less traffic and cause more minor collisions.

Exhibit 10: Cloverdale Bypass – Fatality and Injury Collisions

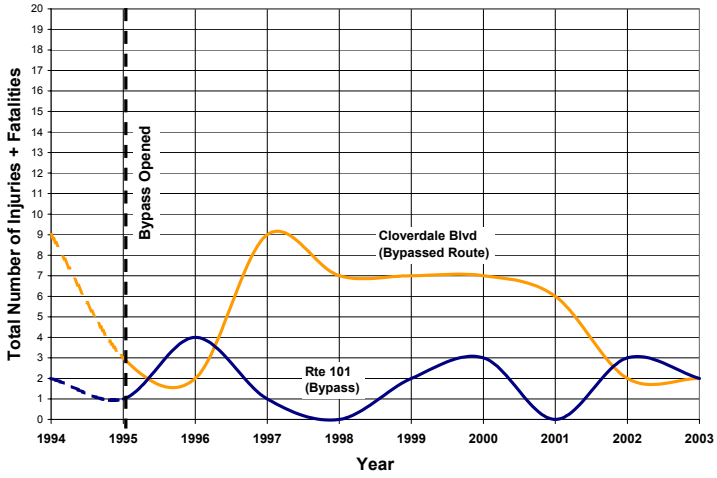
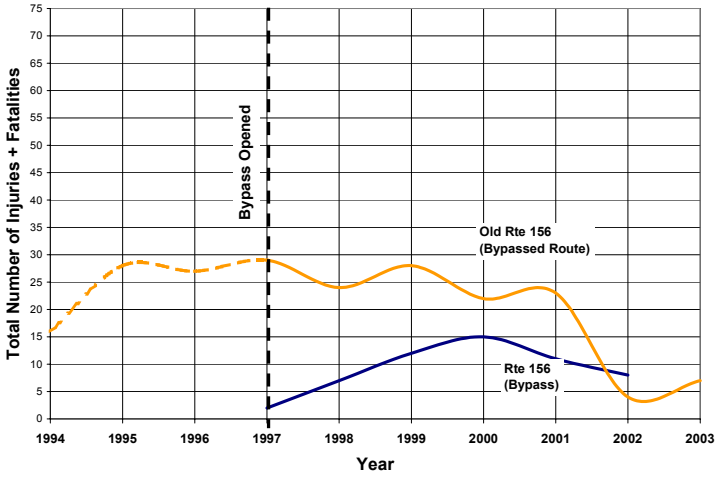


Exhibit 11: Hollister Bypass – Fatality and Injury Collisions



The two bypasses were constructed at about the same time, so another possibility is that the increase in collisions is due to general economic and traffic conditions rather than the opening of bypasses. The project team tested this theory by examining collision rates, which control for traffic levels. As shown in Exhibits 12 and 13, the patterns for the collision rates were similar, although somewhat muted, to those for the number of collisions.

Exhibit 12: Cloverdale Bypass - Total Collision Rate

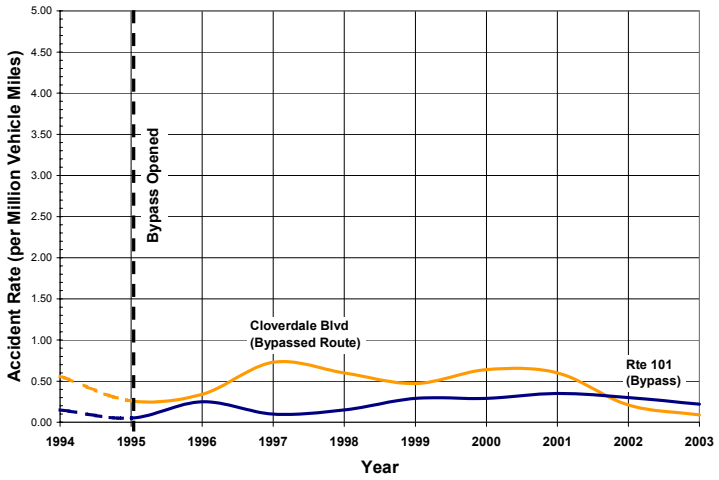
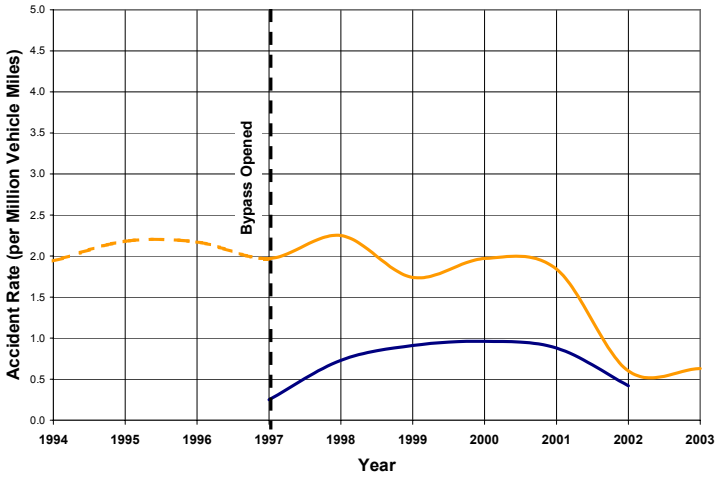


Exhibit 13: Hollister Bypass - Total Collision Rate



The collision rates for the new bypasses show similar rise and fall patterns, so the change in collision rates may be due to other factors:

- Small towns – The number of collisions in small communities is typically fairly small. For example, Cloverdale Boulevard had only 13 collisions in 1994. Since this is a small base, a single collision can change the collision rate drastically.

- Traffic volumes – Caltrans validates the traffic volumes used to derive collision rates only once every three years. Traffic volumes are estimated for intervening years. There may also be only one count station in a given community. Relatively low collision rates could be influenced strongly by the frequency and location of traffic data collection.

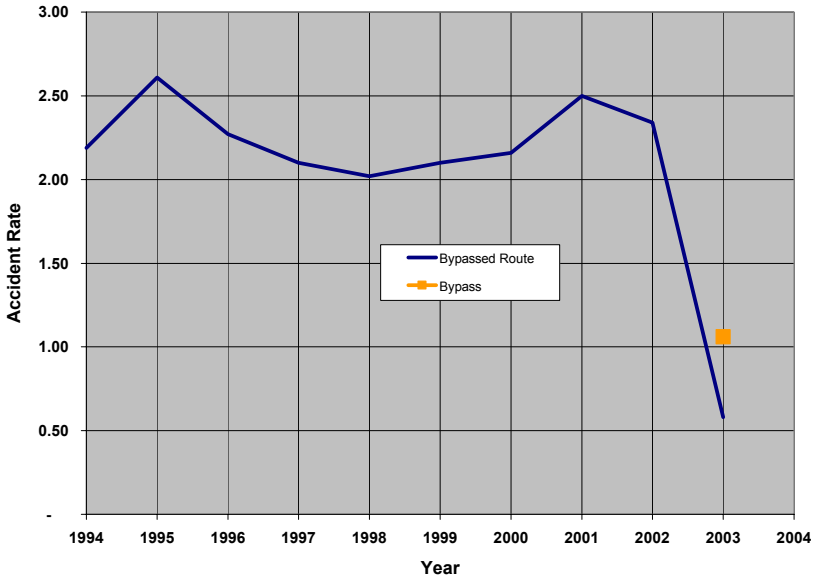
- Causal factors – While the TASAS database includes information on causal factors, such as drugs, alcohol and speeding, the number of collisions was too small to control for these factors. A few collisions due to factors other that a bypass opening (such as drunk driving) could lead to higher collision rates despite the construction of a bypass.

- Collision type – New bypasses may help reduce certain types of collisions, while not impacting the frequency of other collisions. For example, as cited in some of the project study reports, bypasses may reduce side collisions at key intersections or near downtown parking areas, but may not reduce rear-end collisions at stoplights. The project team was unable to consider the effect of collision type, again due to the small number of collisions near the two bypasses.

- Operational changes – Communities may also influence collision rates by changing downtowns in ways that alter highway operations. For instance, a reduction in truck traffic in the downtown area due to a bypass may encourage a community to introduce a new parking scheme. While this scheme may be intended to enhance downtown business, it may also impact collision rates.

TASAS data are available for only one year (2003) after the Truckee bypass opened. However, it shows a substantial improvement in local traffic safety. As shown in Exhibit 14, the number of collisions along SR-267 in Truckee ranged between 2.02 and 2.61 collisions per million vehicle-miles (MVM) in the decade before the bypass was built. Immediately after the bypass opened, the collision rate along the old route dropped from 2.34 collisions per MVM in 2002 to only 0.53 collisions per MVM in 2003 due to the diversion of traffic. Note that the drop started to occur in 2002, reflecting the two months the bypass was open that year. The collision rate along the new bypass route was 1.05 per MVM in 2003. While higher than the rate along the former route during the same time period (due to traffic volumes and out-of-town drivers), it was significantly lower than the rates along SR-267 during the previous year. The average rate across both facilities shows that the construction of the bypass helped reduce collisions in the area.

Exhibit 14: Collisions per Million Vehicle Miles in Downtown Truckee



Source: Caltrans Traffic Collision Surveillance and Analysis System

On the basis of this very limited data, the project team is unable to draw concrete conclusions about the safety impacts of bypasses. However, they are most likely to improve traffic safety or keep collision rates unchanged. Interviews conducted during the field visits indicate that there are often perceived safety issues for pedestrians when high volumes of through traffic occur in downtown areas. By removing this traffic, bypasses have the potential to improve the perception of safety, which may be as important to the public as measurable improvements in traffic safety.

Truck Traffic

Although truck traffic is likely to affect individual communities differently, the quality of life issues associated with trucks (noise, dust, idling, safety, and air quality) are a function of the percentage of trucks in town. The project team examined truck traffic in California small towns using a combination of traffic and truck counts from the Caltrans Division of Traffic Operations and population data from the Department of Finance. By combining these data with GIS land-use data, the project team was able to compare traffic volumes in town with those leaving and entering town.

Exhibit 15 shows the truck shares of traffic counts for pass-through traffic and for local traffic. The differences in traffic volumes outside town limits with those inside are assumed to be through traffic. As the exhibit indicates, trucks make up a particularly high share of traffic in smaller towns, since there is relatively less locally-generated automobile traffic. This indicates that the likelihood of noise, dust and idling issues may be particularly severe in smaller towns and that bypasses may help reduce these issue in affected towns.

Exhibit 15: Truck Percentage of Traffic on State Highways

Community Population	Truck Share of Through Traffic	Truck Share of Local Traffic
0 - 10,000	10.4%	8.2%
10,000 - 25,000	9.6%	13.5%
25,000 – 50,000	5.6%	5.9%

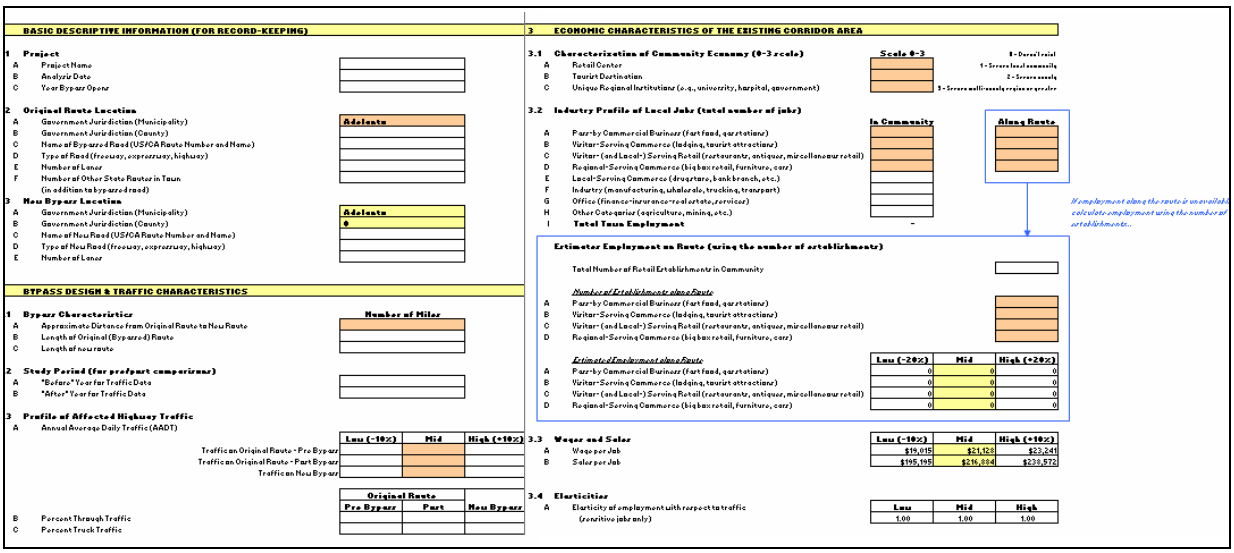
It is interesting to note the difference in the truck shares of local and through traffic. Trucks have a large share of local traffic, particularly in towns with populations ranging from 10,000 to 25,000. Since bypasses are unable to remove this traffic from local roads, their impact on mid-sized towns may be muted by local truck traffic. Improvements in air quality and collision rates are likely to rate most important in larger towns due the greater number of vehicles operating in those communities.

HIGHWAY BYPASS IMPACT (HBI) MODEL

The project team developed the Highway Bypass Impact (HBI) model as part of the California Bypass Study. The HBI Model is designed to be a high-level, quick-response tool for transportation planners, engineers, policymakers, and other interested parties to estimate the potential economic impacts of proposed highway bypasses on California communities. The project team based the model on findings from the literature review and calibrated it using the California case studies and a database of bypasses from around the country.

The model is spreadsheet-based and simple to use. It requires basic inputs about the bypass design, traffic in the area, and the local economy. Exhibit 16 shows a sample of the inputs required by the HBI Model.

Exhibit 16: Highway Bypass Impact (HBI) Model Input Page



The HBI Model estimates impacts in terms of losses in jobs, sales, and wages immediately after the bypass opens and in the longer term. The intention is to provide a range of impacts that can be used to understand how the local economy may adjust to the bypass and frame discussions with local businesses, governments, Native American representatives, and other stakeholders.

The model estimates economic shifts by recognizing that bypasses generally have three types of impacts:

- Potential economic losses along the original route for businesses dependent on pass-through traffic
- Potential economic gains due to downtown redevelopment that attracts business from local residents and visitors

- Potential economic gains due to new development along the bypass.

The first set of impacts are estimated using the Institute of Transportation Engineers (ITE) trip generation tables for specific types of business that depend on pass-through or local traffic:

- Pass-by commercial business (fast food and gas stations)
- Visitor-serving commerce (lodging and tourist attractions)
- Visitor and local-serving retail (restaurants, antiques, and miscellaneous retail)
- Regional-serving commerce (big box retail, furniture, and automobiles).

These impacts are generally based on annual average daily traffic (AADT), but the HBI Model also considers the composition of the local economy. The calculation results in a conservative estimate of the disbenefits, since pass-through traffic probably has a lower propensity to stop than indicated by the ITE tables.

A bypass can provide additional highway capacity by adding lanes along the bypass and by shifting traffic and freeing capacity on the original route. When a bypass first opens, the shift in travel patterns causes a drop in traffic passing storefronts on Main Street, although some bypass traffic may be induced to detour and use services in downtown as a result of signage, visibility, or habit. Traffic models do not often consider the potential for pass-through traffic to use the original route to obtain services, like food and gasoline. In the longer-term, traffic will grow along Main Street as a result of local, visitor, and through traffic taking advantage of available capacity.

The second and third sets of impacts (downtown redevelopment and development along the bypass) depend on local circumstances. For example, a community that is visitor-oriented will be able to redevelop the downtown and take advantage of more pedestrian-friendly atmosphere resulting from less traffic. A community that has land available along the bypass and plans residential, office, or industrial development will benefit economically from the bypass, which provides access to the new development. The model cannot estimate future plans from user inputs, so Caltrans planners and engineers need to estimate these impacts based on discussions with local planners.

The HBI Model provides a second estimate of economic impacts using comparable case studies from a database of national and California bypasses. These estimates include the development and redevelopment impacts described above, but they do not take into account before and after traffic shifts. A range of impacts are provided and any given bypass could be at the high or low end of the range, depending on the local geographic situation, the local economy, and complementary efforts made by the local community (such as redevelopment).

It is expected that Caltrans planners and engineers would use both sets of estimates to frame discussions with local community. The first set of estimates helps describe what will happen when traffic shifts away from Main Street. As most people would expect, traffic-dependent businesses lose some patronage. This may highlight the community's worst fears, but the model also shows that some of the traffic on the bypass may continue to use services in town. Caltrans and the local community may be able to mitigate initial disruptions by following some of the best practices outline earlier in the report – developing business plans around the bypass, leveraging the bypass for redevelopment of the downtown, helping to plan the new economy, providing good visibility and signage for travelers, designing bypass interchanges by considering the economic decisions of travelers, etc. The model also shows that even businesses initially hurt by traffic diversion improve as traffic grows along the original corridor.

The second set of estimates helps to show the local community, what could be expected with good and bad planning for the bypass. Some of the estimates are negative, while others are positive. By laying out the potential futures early on, Caltrans planners and engineers can help communities plan and take advantage of bypass construction. In some cases, this means improving the economy. In others, this simply means mitigating negative impacts.

A separate report provides detailed technical documentation for the model documentation with an explanation of assumptions and coefficients. A user's guide is also available.

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